United States Department of the Interior

FISH AND WILDLIFE SERVICE

California/Nevada Operations Office
2800 Cottage Way, Room W-2606
Sacramento, California 95825

IN REPLY REFER TO:

Memorandum

To: Field Supervisor, Ventura Fish and Wildlife Office,
Ventura, California

From: Manager, California/Nevada Operations Office,
Sacramento, California

Subject: Reinitiation of Formal Consultation on the
Containment Program for the Southern Sea Otter (1-8-99-FW-81)

This document constitutes the U.S. Fish and Wildlife Service's biological opinion based on our review of the containment component of the translocation program authorized under Public Law 99-625 and its effects on the federally threatened southern sea otter (*Enhydra lutris nereis*), in accordance with section 7 of the Endangered Species Act of 1973, as amended (ESA). This document was prepared as a result of reinitiating intra-Service consultation on the containment program.

Reinitiation was prompted by the Service's receipt of substantial new information on the population status, behavior, and ecology of the southern sea otter that may reveal effects of the action on this species that were not previously considered. Specifically, the following information and circumstances prompted this reinitiation:

1. In the winters of 1997-98 and 1998-99, southern sea otters moved into the management zone in numbers that were much greater than had previously occurred during the preceding 11 years of the translocation program.

2. Analysis of carcasses has shown that southern sea otters are being exposed to environmental contaminants and diseases which could be affecting the health of the population.

3. The number of southern sea otters range-wide has been declining, based on information obtained from regular surveys.

4. More recent information indicates that southern sea otters at San Nicolas Island may not be isolated from the potential effects of a single, large oil spill. Consequently, a larger

range occupied by southern sea otters along the mainland coast is important for their protection from oil spills.

5. Given that the population along the mainland has been declining, the capture and release of large numbers of southern sea otters may have adverse effects that were not considered in the original biological opinion.

The following information was used to prepare this biological opinion: Public Law 99-625; the regulations which implement Public Law 99-625 (50 *Code of Federal Regulations* 17.84(d)); the final environmental impact statement for the translocation program (Service 1987a); the original biological opinion on the translocation program (Service 1987b); a report on the population status of the southern sea otter (U.S. Geological Survey - Biological Resources Division [BRD] 1998); a summary of the movement of southern sea otters into the southern Santa Barbara County area (California Department of Fish and Game [CDFG] 1998); numerous articles on disease, the potential effects of contaminants on southern sea otters, and other potential sources of mortality; the original recovery plan and drafts of revised recovery plans for the southern sea otter (Service 1982, 1995a, 2000); draft reviews of the translocation program (Service 1992, 1993); and internal documents contained in the Service's files. Information regarding the establishment of a colony of southern sea otters at San Nicolas Island was also used in developing this biological opinion. A complete administrative record of this consultation is on file at the Service's Ventura Fish and Wildlife Office.

The Service is also evaluating whether the failure criteria for assessing the translocation program, of which the containment program is a component, have been met; these criteria are provided in the regulations which implement Public Law 99-625. Although much of the information on southern sea otters and the history of the programs is relevant to both reviews, the evaluation and section 7(a)(2) consultation are being conducted as separate processes. Drafts of the evaluation and the biological opinion were provided, in March 1999, to the Marine Mammal Commission, the CDFG, and the Biological Resources Division, U.S. Geological Survey for their review and comment and to generate discussion on the future management of the southern sea otter with regard to the translocation program and the management zone. The documents have also been provided to the public to elicit comments on the information in them and any new information relevant to the issue.

The Service received 16 comment letters on the draft biological opinion and evaluation. A list of those who provided comments is attached. Several letters voiced support or opposition for a given course of action. These letters discussed the effects of southern sea otters on marine ecosystems and their opinions ranged from noting that shellfish resources are depleted by the presence of otters to concluding that the overall biological diversity of an area is enriched by the presence of southern sea otters. The Marine Mammal Commission's and California Coastal Commission's comments included direction on procedures they believe the Service must undertake if it desires to alter the current translocation or containment programs. Numerous letters requested clarification of particular points in the biological opinion. Others noted that

southern sea otters probably did not occur in large numbers in the current management zone historically because of hunting by native Americans and natural oil seepage.

The CDFG provided the most extensive set of comments on the biological opinion. In general, the CDFG voiced opposition to any change in the current management zone, disputed portions of the history and background of the translocation and containment programs as described in the biological opinion, and disagreed with the overall conclusion of the Service.

In this final biological opinion, we have clarified statements in the draft opinion that generated confusion among some reviewers. We have not addressed issues that are not relevant to the primary purpose of this biological opinion, which is to determine whether continuation of the containment program is likely to jeopardize the continued existence of the southern sea otter. Consequently, we have not addressed comments regarding, for example, the efficiency (as opposed to lethality) of the methods used by the Service to capture southern sea otters in the management zone or the effects of the southern sea otter on the shellfish industry or recreational fishing.

Based in part on this biological opinion and in part on other significant new information relevant to the translocation program that has become known since the program was initially reviewed under the National Environmental Policy Act (NEPA) in 1987, including the recent decline in the southern sea otter population, the Service intends to undertake a comprehensive review of the translocation program under NEPA and evaluate: whether the program, or some of its components, should continue; modifications to the program; and termination of the program. Through the NEPA process, which affords a full opportunity for public review and comment, the Service will analyze the translocation program and alternatives to the program and likely propose modifications to 50 CFR 17.84, the regulations that implement the translocation program authorized under Public Law. 96-625.

BACKGROUND

Definitions

For the purposes of this biological opinion, "southern sea otter" will always be used when referring to the listed population of the sea otter which occurs along the coast of California. "Sea otter" will always be used when referring to the species, which also occurs along the coasts of Washington, Canada, Alaska, and Russia.

"Parent range" refers to the region along the central coast of California, north of Point Conception and the management zone, where the population of southern sea otters resided at the time the translocation program was initiated. "Translocation zone" refers to the area around San Nicolas Island defined at 50 CFR 17.84 to which southern sea otters from the parent range were translocated. "Management zone" refers to the area south of Point Conception, but not including the translocation zone, from which southern sea otters are to be excluded. Pursuant to Public

Law 99-625, any southern sea otter found within either the translocation zone or the management zone is considered to be a member of the "experimental population." The attached maps depict all of the locations cited in this biological opinion.

The translocation program technically includes both the movement of southern sea otters from the parent range to San Nicolas Island and containment activities aimed at keeping southern sea otters from the management zone. However, for the purposes of this biological opinion, "translocation program" will be used to refer only to the capture and transport of southern sea otters from the parent range to San Nicolas Island. "Containment" will be used to refer only to the removal of southern sea otters from the management zone.

Public Law 99-625

The recovery plan (Service 1982) for the southern sea otter set forth recovery goals which included minimization of risk from potential oil spills and the establishment, via translocation, of at least one additional breeding colony outside the range that existed at that time. The dual goals of the translocation effort, as stated in the final environmental impact statement (Service 1987a), were to reduce the probability that more than a small portion of the population could be decimated by any single natural or human-caused catastrophe and to allow additional data to be obtained for assessing translocation and containment techniques, population status, and the influence of southern sea otters on the nearshore community. Translocation was viewed as paramount to achieving recovery and establishing a data base for identifying the optimal sustainable population level for the southern sea otter as required under the Marine Mammal Protection Act (MMPA).

Translocation of a listed species is generally authorized under the ESA and, under certain specific circumstances, translocation of species to establish experimental populations is authorized under section 10(j) of the ESA. The southern sea otter, however, is protected by both the ESA and the MMPA, and prior to the amendments of 1988, the MMPA did not allow translocation for the purpose of conservation. Additionally, opposition from commercial fishing and other interests presented an obstacle to the establishment of a second colony. These dilemmas were resolved in 1986 with the passage of Public Law 99-625 which allowed the translocation of southern sea otters and the establishment of a management zone surrounding the translocation zone from which southern sea otters would be removed.

Public Law 99-625 specifically authorized and provided the mechanisms by which the Service could establish a second colony of southern sea otters through translocation of animals to San Nicolas Island, the site that was ultimately chosen by the Service. The legislation allowed the Service to develop a translocation plan that was included as an appendix to the environmental impact statement (Service 1987a). This translocation plan:

1. described the number, age, and sex of southern sea otters to be translocated;

2. described the methods of capture, translocation, release, monitoring, and protection;

3. specified a translocation zone where southern sea otters would be relocated;

4. specified a management zone, which would surround the translocation zone but would not include the existing range of the southern sea otter or adjacent areas where expansion is needed for the recovery of the species;

5. described measures to isolate and contain the experimental population, backed up by an adequate funding mechanism;

6. described the relationship of translocation to the status of the species and to future section 7 determinations relative to either the parent population or the experimental population; and

7. provided for administration of the plan in cooperation with the State of California.

Public Law 99-625 also states that all containment of southern sea otters must be accomplished using non-lethal techniques. The legislation provides that southern sea otters within the translocation zone will be treated as a threatened species for the purposes of the section 7 consultation process; however, southern sea otters will be treated as a species proposed for listing in relation to activities conducted by the Department of Defense. Southern sea otters within the management zone are also treated as a species proposed for listing. Section 9 of the ESA applies to the experimental population, except that otherwise lawful activities within the management zone are exempted from the prohibitions against take under both the ESA and the MMPA.

Translocation and the Translocation Zone

The purpose of the translocation zone is described above under the section entitled "Public Law 99-625." The Service evaluated potential translocation sites along the entire west coast of the United States (Service 1987a). The evaluation recommended four sites as suitable for translocation: San Nicolas Island, the coast of northern California, the coast of southern Oregon, and the coast of northern Washington (52 *Federal Register* 29784). San Nicolas Island was selected as the preferred translocation site because: the habitat is highly suitable for southern sea otters; the protection of the colony and law enforcement needs could be more easily met; its isolated and insular nature, surrounded by wide, deep ocean areas, offered the greatest potential for containment; it offered the least potential conflict with shell fisheries; and the potential for a well-designed research program appeared better than at other sites (Service 1987a).

The final environmental impact statement for the translocation program (Service 1987a), the translocation plan, and the regulations which implement Public Law 99-625 (at 50 CFR 17.84(d)(3)) describe the methods by which southern sea otters would be captured, moved to the translocation zone, and released. A maximum of 70 southern sea otters would be moved to San Nicolas Island during the first year of the program. This number could have been supplemented with up to 70 animals annually in subsequent years, if necessary, to ensure the success of the translocation and prevent the nucleus group from declining into an irreversible downward trend. The maximum number to be moved was limited to 250 animals. The goal was to ensure that

approximately 70 southern sea otters would remain at the island and form a nucleus of breeding animals from which the new colony would grow toward the carrying capacity of the environment. The Service anticipated that the population at San Nicolas Island would eventually reach the carrying capacity of the habitat, which was estimated at a minimum of 280 in as few as 11 or as many as 30 years. In the preamble to the final rule (52 *Federal Register* 29754), the Service estimated that the carrying capacity at San Nicolas Island could be as high as 400 to 500 animals.

Southern sea otters were to be removed primarily from the southern third of the parent population. Diver-held devices, dip nets, surface entangling nets, or other methods that were proven to be safe and effective were to be used to capture southern sea otters. All captured southern sea otters would be tagged and examined by a veterinarian familiar with marine mammals.

All captured animals would be transported directly to the translocation zone or held in specially constructed holding facilities prior to transport. Southern sea otters would be released directly into the wild at the translocation site or held for up to 5 days in secured floating pens. The regulations implementing Public Law 99-625 specified that no more than 10 southern sea otters could be held in a single pen and that adult males would be held separately. The release of the animals to the wild from the pens would be passive; that is, the doors to the pens would be opened and the southern sea otters allowed to leave as they desired.

The regulations also specified that monitoring of the parent and experimental populations must be conducted. The parent population was to be studied to assess the effects of the removal of the translocated animals and to determine its growth and changes in range. Monitoring of the translocation zone was to include intensive studies of the nearshore ecosystems at San Nicolas Island and documentation of numerous aspects of the ecology and behavior of southern sea otters. Much of the research that was envisioned has occurred. Some research proved to be unfeasible and some activities, primarily monitoring, are ongoing.

Between August 1987 and March 1990, 139 southern sea otters were translocated to San Nicolas Island; one additional southern sea otter was released there after rehabilitation at the Monterey Bay Aquarium. (In different reports on the translocation program, the rehabilitated southern sea otter is variously added into or left out of the total number of individuals translocated to San Nicolas Island. In referring to numbers of individuals moved to San Nicolas Island in this biological opinion, we use the word “translocated” only when we are certain the numbers refer to translocated individuals.) By July 1988, after the first year of translocation efforts, 69 southern sea otters had been transported to the island, but only 20 could be located at the island. Three of the original 69 animals died at the island before they were released, two were found dead on the mainland, and one was recaptured and removed from the management zone (Service 1988). Two southern sea otters, a female and her pup, that entered the management zone were captured as part of the containment program and returned to the parent range; the pup was presumed to have died shortly thereafter (Sanders pers. comm. 2000). An additional four southern sea otters died at Monterey Bay Aquarium before they could be transferred to San Nicolas Island; these individuals are not included in the numbers used to describe the translocation program.

By the end of the second year of translocations, a total of 126 southern sea otters had been moved to San Nicolas Island, but only 17 remained at the island. Thirteen additional southern sea otters were translocated to San Nicolas Island in 1990, with the last translocation occurring in July 1990 (Service 2000). At the end of that year, the population at San Nicolas was estimated at 15 animals (Service 1990).

Southern sea otters were not translocated to San Nicolas Island during 1991 for several reasons (Service 1991). State and Federal permits were not issued in time. Coordination with the California Coastal Commission also required additional time. Finally, the tank space at Monterey Bay Aquarium needed to hold southern sea otters for evaluation by veterinarians was being used for rehabilitating stranded individuals. (The aquarium routinely cares for and releases, if possible, stranded and injured southern sea otters; the individuals using the tank space in 1991 were not associated with the translocation program.)

During the translocations that had occurred through 1990, the Service noted that the release of four or more southern sea otters at San Nicolas Island within1 week apparently disrupted the behavior of the previously released animals (Service 1990). To address this potential problem, the Service decided to release no more than four individuals at any one time (Service 1990). Later, the Service ceased additional translocations to eliminate the possibility that the addition of new animals would disturb resident southern sea otters. Through this process, we hoped that the fledgling colony at San Nicolas Island would grow and eventually become established (Benz pers. comm. 2000).

After carefully reviewing the annual reports, we have compiled the following summary of the fates of animals involved in the translocation and containment programs. A minimum of 36 of the 140 southern sea otters released at San Nicolas Island are known to have returned to the parent range along the central coast of California; in addition, 11 were captured in the management zone and released back into the parent range (Service 1993). Three southern sea otters died at San Nicolas Island in the holding pens prior to being released (Service 1988). As of 1993, seven southern sea otters had been found dead in the management zone; six of these were confirmed as translocated individuals (Service 1988, 1989, 1990, 1991). Four individuals that had been translocated to San Nicolas Island were found dead in the parent range (Service 1992a, 1993a). At least 7 animals that had been translocated were known to have taken up residence at San Miguel Island; most of the 11 independent southern sea otters at San Nicolas Island as of 1993 were recognizable as having been translocated to the island (Service 1993a). A minimum of approximately 73 southern sea otters is missing. (At this time, we cannot provide a precise number of missing animals because some individuals may be counted in two of the above classes; for example, the four animals that were found dead in the parent range may also be included in the 36 that were known to have returned to the mainland. Also, the annual reports do not precisely state how many of the individuals remaining at San Nicolas Island are translocated animals.) The remaining animals may have emigrated from the translocation zone or died. Although a southern sea otter was known to have been entrapped in a lobster trap at Santa Cruz Island and similar traps are abundant at San Nicolas Island, no study to confirm this as a source of mortality has been undertaken because of the difficulty of carrying out such an investigation.

Containment and the Management Zone

Section 1(b)(4)(B) of Public Law 99-625 provides that the purpose of the management zone is to "facilitate the management of [southern] sea otters and the containment of the experimental population within the translocation zone, and to prevent, to the maximum extent feasible, conflict with other fishery resources within the management zone by the experimental population" by requiring the capture of southern sea otters found within it and their transfer to the parent range or translocation zone. The management zone is depicted on the attached maps. It generally can be described as the area south of Point Conception, Santa Barbara County, with the exception of the translocation zone. At the time of the legislation, the range of the southern sea otter did not extend as far south as the management zone.

The containment program was intended to prevent southern sea otters from dispersing from and becoming established at sites that were outside of the translocation zone and outside of the parent range (i.e., the management zone). The Service anticipated that containment would occur indefinitely unless the translocation program failed. Public Law 99-625 requires that all containment of southern sea otters must be accomplished using non-lethal techniques. The containment program called for the Service and the CDFG to jointly manage an effort to locate southern sea otters that leave the translocation zone and to remove, by non-lethal means, those that enter the management zone, either from the translocation zone or the parent range. Reports from other Federal and State agency personnel, commercial fishermen, boat skippers, and the general public were to be used to assist the Service and CDFG in locating southern sea otters in the management zone.

The methods by which southern sea otters were to be removed from the management zone are essentially the same as those described previously in this biological opinion for the capture of animals from the parent range. Southern sea otters within the management zone would be captured by experienced State and Federal personnel using appropriate methods such as diver held traps, surface entangling nets, or dip nets. The most effective capture technique identified to date involves a diver, equipped with a closed circuit oxygen re-breather, using a Wilson trap. This technique enables the diver to approach southern sea otters without producing the noise or odor associated with conventional SCUBA gear.

The translocation plan (appendix B in Service 1987a) notes that if "problems in maintaining the management zone free of [southern sea] otters were related to pressures exerted by growth and expansion of the donor (i.e., the parent) population, it may be possible to alleviate such pressure by implementing an experimental population thinning concept in the area immediately north of Point Conception and Point Arguello or another appropriate location." The translocation plan also notes that this action would be considered only if necessary to maintain the management zone so the entire translocation and establishment of the experimental population would not need to be declared a failure. Public Law 99-625 does not authorize such an action. The regulations (50 CFR 17.84(d)(6)) state that capturing animals within the management zone and returning them to the experimental or the parent population is the preferred method of containment. The regulations further note that artificial reduction of fecundity and selective or random, non-lethal removal of some individuals of the experimental population at San Nicolas Island are potential

mechanisms "to prevent significant emigration of southern sea otters from San Nicolas Island and occupation of habitat within the management zone." To implement such actions, the Service would need to seek additional authority or conduct an experimental program under the provisions of section 10(a)(1)(a) of the Act.

The Service predicted, based at least in part on previous successes that it and others had experienced in capturing large numbers of sea otters fairly easily, that all individuals entering the management zone could be captured and returned to the parent population. In reality, capturing southern sea otters through non-lethal means, as required by Public Law 99-625, proved to be difficult in many cases. In the late 1980s and early 1990s, the Service responded to sightings of southern sea otters in the management zone. The Service was often unable to find reported individuals again; if detected, capture efforts were not always successful. A specific example of the difficulty the Service experienced in capturing southern sea otters is provided in the section of this biological opinion entitled Previous Reviews of the Translocation Program.

Successful captures during containment efforts were often associated with the identification of particular areas where southern sea otters tended to congregate, such as Cojo Anchorage and San Miguel Island. These efforts were successful largely because the Service could travel directly to a known location, rather than spending time in often futile searches for individuals that may not be staying in a single location for long periods. The large size of the management zone - it extends from Point Conception to the Mexican border and includes all of the Channel Islands, with the exception of San Nicolas - hindered search and capture efforts. The difficulties the Service experienced in finding the occasional animal that strayed into the management zone called into question the Service's ability to contain large numbers of southern sea otters.

All southern sea otters captured in the management zone have been returned to the parent range. We concluded that, because of the high rate of emigration from San Nicolas Island, southern sea otters returned to the parent range would have a greater likelihood of not returning to the management zone than if they were taken to San Nicolas Island. Initially, southern sea otters captured in the management zone which had traveled there from San Nicolas Island were returned to the site of their original capture prior to being translocated. However, because of the difficulty and time involved in reaching some of these remote sites, the Service eventually released all southern sea otters captured as part of the containment effort at two sites in Santa Cruz County. Male southern sea otters were released in the vicinity of a male group; females were released near a female group.

Failure Criteria for the Translocation Program

The regulations that implement Public Law 99-625 identified five criteria for determining whether the translocation program is a failure (50 CFR 17.84(d)(8)). According to the regulations, the translocation would be considered to have failed if one or more of the following criteria are met:

1. If, after the first year following initiation of translocation or any subsequent year, no translocated otters remain within the translocation zone, and the reasons for emigration or mortality cannot be identified and/or remedied;

2. If, within 3 years from the initial transplant, fewer than 25 otters remain in the translocation zone and the reason for emigration or mortality cannot be identified and/or remedied;

3. If, after 2 years following the completion of the transplant phase, the experimental population is declining at a significant rate, and the translocated otters are not showing signs of successful reproduction (i.e., no pupping is observed); however, termination of the project under this and the previous criterion may be delayed if reproduction is occurring and the degree of dispersal into the management zone is small enough that the effort to remove otters from the management zone would be acceptable to the Service and the CDFG;

4. If the Service determines, in consultation with the affected State and the Marine Mammal Commission, that otters are dispersing from the translocation zone and becoming established within the management zone in sufficient numbers to demonstrate that containment cannot be successfully accomplished. This standard is not intended to apply to situations in which individuals or small numbers of otters are sighted within the management zone or temporarily manage to elude capture. Instead, it is meant to be applied when it becomes apparent that, over time, otters are relocating from the translocation zone to the management zone in such numbers that: (a) an independent breeding colony is likely to become established within the management zone; or (b) they could cause economic damage to fishery resources within the management zone. It is expected that the Service could make this determination within a year provided that sufficient information is available;

5. If the health and well-being of the experimental population should become threatened to the point that the colony's continued survival is unlikely, despite the protections given to it by the Service, State, and applicable laws and regulations. An example would be if an overriding military action for national security was proposed that would threaten to devastate the colony and the removal of otters was determined to be the only viable way of preventing loss of the individuals.

If, based on any one of these criteria, the Service were to conclude after consultation with the affected State and Marine Mammal Commission that the translocation has failed to produce a viable, contained experimental population, the original experimental population rulemaking would be amended to terminate the experimental population, and all southern sea otters remaining within the translocation zone would be captured and placed back into the range of the parent population. Efforts to maintain the management zone free of southern sea otters would be curtailed after reasonable efforts had been made to remove all southern sea otters that were within the management zone at the time of the decision to terminate the experimental population (e.g., after joint State and Service consultation concluded that additional effort would be futile).

Prior to declaring the translocation a failure, a full evaluation would be conducted into the probable causes, and if the causes could be determined and reasonable remedial measures identified, consideration would be given to continuing to maintain the experimental population. If

such reasonable measures could not be identified and implemented, the results of the evaluation would be published in the *Federal Register* with the rulemaking proposing termination of the experimental population.

Previous Reviews of the Translocation Program

In March 1992, after 5 years of experience with the translocation and containment programs, the Service drafted a document for use as background and discussion material for a meeting with the CDFG to re-evaluate recovery efforts for the southern sea otter (Service 1992). The draft document included background material on the rationale for listing the southern sea otter as a threatened species, the recovery objectives of the recovery plan, a summary of the translocation program, identification of major issues affecting recovery, a discussion of containment in the management zone, and management options that could be employed to enhance recovery.

As stated in the draft document, in 1992, the major issues the Service viewed as affecting the recovery of the southern sea otter were the existence of the management zone and the feasibility of non-lethal containment techniques. The Service noted at the time that establishing a translocated population of southern sea otters at San Nicolas Island had proven to be difficult and that, since translocations of southern sea otters to San Nicolas Island had ceased, the number of individuals at the island had never exceeded 17. (In April 2000, 23 southern sea otters were counted at San Nicolas Island [Sanders pers. comm. 2000].) Further, the Service observed that even if a viable population were eventually established, a southern sea otter colony at San Nicolas Island may not provide substantial protection to the species in the event a large oil spill contacted the parent population. Observations from the *Exxon Valdez* oil spill demonstrated that impacts from such a spill could be far reaching. For example, oil dispersed from the *Exxon Valdez* spread over 400 linear miles in 30 days; this area greatly exceeds the present range of the southern sea otter, including San Nicolas Island. The efforts to contain the oil spilled from the *Exxon Valdez* and to capture and rehabilitate sea otters proved to be ineffective in protecting a substantial portion of the sea otter population.

The draft document also discussed the difficulty in containing southern sea otters. The Service noted that improvements in equipment (e.g., use of a rebreather which allows divers to approach animals without being detected) and greater experience in capturing southern sea otters were positive changes that would assist in containment. However, environmental factors, such as weather, the condition of the sea, and water clarity, remained the major factors that influence the success of capture efforts. As an example, four one-week-long trips, using a chartered vessel, and an additional trip with a Service vessel were made to San Miguel Island to attempt to capture 10 southern sea otters. This effort resulted in the capture of only two of the southern sea otters. Although the circumstances surrounding this capture effort may be those of a worst case scenario, it provides an example of the potential difficulty in maintaining the management zone.

The draft document stated that the long-term feasibility of non-lethal containment was possible provided that several assumptions on which the containment program had been based proved accurate. First, the number of animals in the management zone that needed to be captured would remain small. At the time the translocation program was conceived, rather abrupt movements of

large numbers of sea otters had been observed on only a few occasions. At the time the translocation program began, the Service believed that, initially, it would need to capture a relatively small number of animals either moving through the management zone from the translocation zone or straying south from the parent population. Although it anticipated that the southward range expansion of the southern sea otter would eventually contact the management zone (Service 1987b), the Service did not specifically address the issue of containing large numbers of individuals in this area. However, because the Service was confident of being able to capture 70 individuals in a month for the translocation program, the issue of preventing southern sea otters from occupying the management zone had not seemed insurmountable at the time the translocation program was initiated. By the time of the draft evaluation, however, the Service had discovered that capture of even a small number of otters could prove difficult, time consuming and expensive.

The second assumption affecting the long-term feasibility of non-lethal containment noted by the Service was that captured southern sea otters would not return quickly to the management zone. The draft document noted, however, that this assumption was also inaccurate as experience with the translocation and containment programs had demonstrated the propensity for southern sea otters to return to the point of capture after their release into either the parent range or the translocation zone.

Finally, containment was assumed feasible if the habitat where captured southern sea otters were to be released was below carrying capacity. As of 1992, southern sea otters had not reached population levels which were thought to be near carrying capacity because only a few individuals remained at San Nicolas Island and the parent population had remained below the projected recovery level. However, the possibility existed that, as the translocation program matured and the southern sea otter population expanded, the carrying capacity of release sites might be exceeded. The final rule for the establishment of an experimental population of southern sea otters at San Nicolas Island (50 CFR 17.84(d)(6)) identifies artificial reduction of fecundity for some southern sea otters within the experimental population and selective or random, non-lethal removal of members of the experimental population within the translocation zone as potential means to keep southern sea otters from occupying the management zone, but reserves this authority. The preamble to the final rule (52 *Federal Register* 29754) notes that the Service would require additional authority to use these means “as a last resort” for keeping the management zone free of southern sea otters. Given that the population of the southern sea otter had not reached the levels necessary for the taxon to be considered recovered, we did not advocate implementing either of these reserved options.

The Service’s draft document notes that, primarily because of the information gained from the *Exxon Valdez* spill, the recovery team for the southern sea otter now recommended that the delisting criteria (under the ESA) include many more individuals distributed over a larger area or a smaller increase in individuals and area, but with a substantial reduction in the risk of an oil spill. The recovery team also recommended, in an internal draft of a recovery plan, that the southern sea otter be allowed to expand its range through natural processes and against further translocation efforts.

An additional factor considered in the Service's draft document was that southern sea otters were expanding their range to the south, toward the management zone, faster than they were to the north; this trend, which had been consistent throughout the recovery of the population in the 20th century was continuing. Based on the results of the translocation and containment programs, the new oil spill information, the trends in range expansion of the southern sea otter, and the recommendations of the recovery team, the draft document (Service 1992) concluded that the management zone could not be maintained in the long-term using available non-lethal techniques, and that the persistence of the management zone would reduce the options available to recover the southern sea otter and likely delay recovery.

In 1993, the Service prepared a second draft evaluation of the translocation and containment programs that assessed the status of the San Nicolas Island colony, translocation efforts and methods, containment efforts and methods, and the failure criteria (Service 1993b). The draft document noted that the degree of dispersal of southern sea otters from San Nicolas Island was much higher than anticipated. Only 11 adult southern sea otters and 4 dependent pups remained at San Nicolas Island (Service 1993).

The draft document also noted that the stress of being captured, held in captivity, and (for some individuals) undergoing surgery to implant tracking devices resulted in a mortality rate that was higher than anticipated, even though a mortality rate of three to five percent (Benz, pers. comm. in Service 1987b) had been expected to result from handling of southern sea otters during translocation. By the time of the 1993 draft evaluation, seven southern sea otters had died at Monterey Bay Aquarium while waiting to be translocated to San Nicolas Island or after surgery to implant radios, three died at San Nicolas Island while waiting to be released, one died after being captured in the parent range for translocation and released at the point of capture, and four died within two weeks of being released after being captured during containment activities. Additionally, one southern sea otter did not recover well after surgery to implant a radio. It was released in the hope that it would recover in the wild but was not seen again; its fate could not be determined but, given its condition upon release, it likely died. Without including the individual whose fate is unknown, 15 southern sea otters were known to have died as a result of the Service's containment and translocation actions. Table 1 summarizes the mortalities known to have occurred as a result of the program. Perhaps more importantly, the fates of most of the southern sea otters moved for translocation and containment purposes were unknown.

The draft document found that two of the failure criteria had been met. Failure criterion 2 states that the translocation program would be considered to have failed if fewer than 25 southern sea otters remain at San Nicolas Island within 3 years of the initial translocation and the reasons for emigration or mortality cannot be "identified and/or remedied." The draft document notes that the most recent survey completed at San Nicolas Island before its preparation detected only seven adult southern sea otters and four dependent pups (Service 1993b). (However, the annual report for this time period states that 11 independent southern sea otters and 4 pups were found (Service 1993a). The Service had not been able to identify why so few individuals remained or propose any action to remedy the problem. For these reasons, the draft document concluded the failure criterion had been met.

Failure criterion 3 states that the translocation program would be considered to have failed if the experimental population is declining and the translocated southern sea otters are not showing signs of reproduction. However, failure criterion 3 allows the Service to delay a determination of failure. It states that the termination of the translocation may be delayed under criteria 2 and 3 if reproduction is occurring and the degree of dispersal into the management zone is small enough that the effort to remove southern sea otters is acceptable to the Service and the State of California. The evaluation notes that 15 adult southern sea otters resided at San Nicolas Island in 1990 after the conclusion of the translocation. In 1993, the number of adults had declined to seven. (As noted in the previous paragraph, the annual report states that 11 independent animals were present (1993a)). Although some reproduction was occurring, most pups were either dying or leaving the island. The draft document noted that successful reproduction must translate into recruitment into the breeding population and concluded the failure criterion had been met. Although some pups may have subsequently bred, the population had not grown.

The Service's 1993 draft evaluation noted that the number of southern sea otters staying in the management zone was relatively small despite the fact that emigration from the translocation zone was high. Many animals apparently swam through the management zone en route to the parent range. If animals remained in the management zone, they were not detected despite routine aerial surveys, an active commercial fishery, and abundant onshore observers. The Service also noted that successful containment efforts, in the form of southern sea otters being found and captured, had resulted from the identification of key areas where individuals tended to congregate, such as Cojo Anchorage and San Miguel Island.

On December 13, 1993, the Service met with the CDFG to discuss the translocation and containment programs. The Service advised that the program had met certain failure criteria and that the translocation program no longer served the recovery purpose as identified in the 1982 recovery plan; the experience with the *Exxon Valdez* was a primary reason for the changed perspective on the value of translocation for recovery. In light of this information, the Service did not believe that the large expense of maintaining containment equipment and personnel could be justified. However, the Service was willing to delay a formal declaration of failure if the CDFG would accept responsibility for the containment program. The CDFG stated that it believed that a decision to declare the translocation a failure was premature and requested time to determine whether it could obtain funding to support the containment effort (CDFG 1999, comment 31 on the draft biological opinion). Because few southern sea otters were moving into the management zone at the time, CDFG believed the issue did not need to be resolved immediately.

On February 14, 1994, the CDFG responded that failure could not be declared on a biological basis because not enough time has passed to allow colonization of San Nicolas Island. The CDFG believed that the wording of the failure criteria allowed for continuation of the program because the Service had not attempted to identify or remedy the reasons for emigration or mortality of southern sea otters transferred to San Nicolas Island. The CDFG recognized the Service's view that the translocation program no longer served the recovery purposes identified in the 1982 recovery plan and was concerned about the effect of southern sea otters on the shellfish industry (Service 1994). In its response to the draft of this biological opinion (CDFG 1999, comment 32), the CDFG notes that, although in 1994 it recognized our view with regard to

recovery, it did not accept that our conclusion was "strongly supported by available data or biologically sound." The Service notified the CDFG that it could not provide funding for maintaining the management zone. Subsequently, the CDFG informed the Service that it had been unsuccessful at securing funds to manage the containment program on a long-term basis.

In 1995, the Service again raised concerns about the viability of maintaining the management zone for southern sea otters using non-lethal techniques. In a status report for the translocation program, the Service stated that containment activities were labor intensive and that, over the long-term, existing techniques were inadequate to maintain a management zone free of southern sea otters (Service 1995b). Finally, the Service noted that a decision regarding success or failure of the program was anticipated in the next year.

Between 1996 and 1999, the Service did not conduct any further evaluation of the translocation program. The Service submitted reports on the translocation program in its annual reports to Congress but these did not review the failure criteria.

Movement of Southern Sea Otters South of Point Conception

In the spring of 1998, approximately 100 southern sea otters moved south of Point Conception. This large-scale movement elicited numerous requests from the shellfish industry to remove these individuals. Throughout June and July, 1998, Service staff met with commercial fishermen, elected officials, environmental groups, and State and Federal agency personnel to describe the status of the southern sea otter population, discuss the prospects for containment, and consider the probability of its success. In August, the Service conducted public workshops in Santa Barbara and Monterey to solicit input from all stakeholders. One result of these events is that the Service is currently conducting the evaluation required by the implementing regulations of Public Law 99-625 to determine whether the translocation program should be determined a failure. By the fall of 1998, most of the southern sea otters had retreated north of Point Conception.

In December 1998, approximately 50 southern sea otters again inhabited the area south of Point Conception. Although the number of southern sea otters in the area decreased greatly during the summer, 152 individuals were present by January 1999. In May 1999, 58 southern sea otters were residing along the mainland coast from Point Conception to about Ventura. By October 1999, one dependent and three adult southern sea otters were observed at San Miguel Island during an aerial survey; an additional southern sea otter was found along the mainland. These were the only individuals detected in the management zone (Service 2000). As of February 2000, we were unaware of any southern sea otters along the mainland coast south of Point Conception (Sanders pers. comm. 2000). However, in May, 2000, 78 southern sea otters were detected in the management zone during aerial surveys, roughly between Point Conception and Refugio State Beach (Harris email 2000).

Repeated expansions of southern sea otters into the management zone and subsequent retreats such as those experienced in the spring of 1998 through May of 2000 will likely continue until, at some point, if they are not contained, southern sea otters will likely become permanent residents of the current management zone. In Prince William Sound, Garshelis *et al.* (1984) believed that

new areas are initially colonized by solitary, older males, followed by groups of males, that are investigating potential breeding territories.

CONSULTATION HISTORY

Public Law 99-625 established the legal basis for the translocation and containment programs and required the development of implementing regulations and a translocation plan. However, the methods by which the program would be implemented were left, in large measure, to the discretion of the Service. Prior to translocating and containing southern sea otters, the Service developed an environmental impact statement (Service 1987a) and an internal biological opinion (Service 1987b) which addressed the proposed translocation program and its component containment program.

Most of the discussion in the previous biological opinion addresses the translocation component of the southern sea otter program. However, several aspects of the translocation program, such as how southern sea otters are captured, handled, and transported, have relevance to the containment program. Despite the thoroughness of the translocation plan, the biological opinion noted that a mortality rate of 3 to 5 percent (or two to four individuals) was expected as a result of "actual translocation" (Benz, pers. comm. in Service 1987b). Stresses from capture, handling, and transport are identified as a source of mortality. In the biological opinion, the Service concluded that the translocation plan was efficient in terms of the manner in which southern sea otters would be captured, handled, transported, and released, and that it included measures to remedy known or suspected causes of stress. The Service further concluded that the level of incidental mortality associated with translocation was considered to be sufficiently low that it was not likely to jeopardize the continued existence of the southern sea otter.

The biological opinion did not specifically discuss mortality associated with containment, although it noted translocated southern sea otters could experience additional stress if they are captured a second time. The selection of San Nicolas Island as the translocation site, with its abundant resources and separation from the mainland, was thought to be the primary means by which southern sea otters would be prevented from entering the management zone from the translocation zone.

The preamble to the final rule for the establishment of the experimental population at San Nicolas Island noted that the purposes of containment included protection of the experimental population of southern sea otters at San Nicolas Island and maintenance of the integrity of the translocation effort as a whole (52 Federal Register 29754). The Service viewed minimizing the potential conflicts between the translocated population and oil and gas industry activities and commercial and sport fisheries as essential for maintaining the integrity of the program. The Service also considered southern sea otters that moved into the management zone to be at heightened risk from legal human activities which could cause injury or death because Public Law 99-625 exempted such activities from the prohibitions of section 9 of the ESA. Promptly removing these individuals as part of the containment program would therefore promote their safety.

The biological opinion further notes that the establishment of Point Conception as the northern limit of the management zone was considered a mitigation measure to protect the shellfish fisheries that had developed south of the point after the extirpation of the southern sea otter from this area. In 1987, the Service (1987b) predicted that southern sea otters may reach Point Conception within 10 to 20 years and noted that Public Law 99-625 required the removal of these animals from the management zone. At the time, large numbers of southern sea otters did not travel south of the Santa Maria River mouth, which is approximately 65 kilometers north of Point Conception. The Service also predicted that southern sea otters would continue to expand their range to the north and reach the mouth of San Francisco Bay within 11 to 15 years. The 1982 recovery plan focused on establishing one or more new colonies outside of the range as it existed at that time, protecting the existing population and its habitat, and minimizing the threats from an oil spill. In summary, because the translocation was expected to result in a new, viable population of the southern sea otter outside of the then current range that would minimize the effects of an oil spill and expansion of the range would continue to the north, the Service (1987b) did not believe that the maintenance of a management zone from Point Conception south would preclude the recovery of the population.

The Service noted in the biological opinion, that unlimited range expansion "would not, in and of itself, necessarily assure recovery" and cited the recovery plan's goals of minimizing threats from oil spills and establishing one or more new colonies outside the existing range as being the more important factors. At that time, we did not anticipate that range expansion could be accompanied by a reduced population size. The Service predicted that, even with a southern boundary for range expansion at Point Conception, the southern sea otter population along the central coast would reach 2,910 individuals by the year 2000. Modeling conducted by the Minerals Management Service (1985 in Service 1987b) predicted that the central coast of California, north of Point Conception, was capable of supporting 3,582 southern sea otters. Based in part on the recovery plan's recommendations, the predicted increase in the southern sea otter population that the central coast north of Point Conception was thought to be capable of supporting, the Service concluded that the translocation program, with its component containment program, was not likely to jeopardize the continued existence of the southern sea otter.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed action is the continuation of the containment component of the translocation program as described at 50 CFR 17.84(d) and in the environmental impact statement for the translocation of southern sea otters to San Nicolas Island (Benz 1996, Service 1987a). The containment program is described in the Background section of this biological opinion. Because the translocation of southern sea otters to San Nicolas Island has been completed, the remainder of the translocation program will not be discussed further in this section.

STATUS OF THE SPECIES/ENVIRONMENTAL BASELINE

The southern sea otter was listed as threatened in 1977 (42 *Federal Register* 2965); critical habitat was not designated. The factors leading to the listing included increased tanker traffic and the potential for oil spills, municipal pollution, and increased harassment caused by increased use of near-shore areas for a variety of human activities.

Distribution and Population Trends

The southern sea otter once ranged from at least northern California to the central coast of Baja California. (The historical northern range limit of the subspecies remains in question. Some authors place it as far north as Prince William Sound in Alaska; others contend that it extended only as far north as northern California or Oregon (Riedman and Estes 1990, Wilson *et al.* 1991). Prior to being protected from hunting for its pelt, the southern sea otter occurred only in a remnant colony near Bixby Creek along the Big Sur coast. Southern sea otters currently inhabit shallow waters along the coast of California in San Mateo, Santa Cruz, Monterey, San Luis Obispo, and Santa Barbara counties and at San Nicolas Island in Ventura County.

The following information on the population status of the southern sea otter is summarized from BRD (1998) unless otherwise noted. By the end of the 19th century, the sea otter had been hunted nearly to extinction throughout its range which extended from Japan, along the northern Pacific rim, to central Baja California; about a dozen colonies remained by 1911 when it was afforded protection from further hunting. Historically, the number of southern sea otters was estimated at 14,000 (Service 1995a); they were known to be abundant at San Nicolas Island. By 1911, the southern sea otter population had been reduced to a remnant colony near Bixby Creek along the Big Sur coast. Until the mid-1990s, the number of southern sea otters along the central coast of California had been generally increasing at a rate of approximately 4 to 6 percent per year (BRD 1998).

When reviewing any account of population trends of the southern sea otter, one must take into account variations in the census technique. In 1982, the Service and the CDFG standardized the survey methods for counting southern sea otters by relying primarily on shore-based counts. The shore-based counts helped to eliminate most of the variation in numbers that occurred when counting from aircraft. Riedman and Estes (1990) note that, prior to 1982, only general trends could be determined from the information received from the surveys.

Additionally, the surveys provide a count of the number of individuals that are in the population at a given time; the accuracy of the counts is affected by numerous factors, such as weather, the condition of the ocean, and the amount of kelp that is present. The surveys are not intended to be an estimate of the population; population estimates are provided by studies, such as mark-recapture efforts. Biologists familiar with the southern sea otter and the census technique acknowledge that the actual number of animals in the population may be higher or lower than what is counted. Consequently, we rely on a 3-year running average of the numbers derived by the counts to assess population trends.

The number of southern sea otters increased to an estimated 1,789 in 1976. The estimated number of southern sea otters declined to 1,443 in 1979 and 1,277 in 1983. The decline was

likely caused primarily by entanglement in coastal set-nets. Although the CDFG has recently noted that other factors may have contributed to this decline and that the change in census technique could have masked real differences in the number of individuals (CDFG 1999, comment 44 on the draft biological opinion), it instituted a limited emergency closure of the set-net fishery in 1982. This closure was based on the fact that entanglement deaths of southern sea otters were discovered in an observer program and the estimated loss rates of more than 100 individuals per year were sufficient to effect a population decline (Estes 1999). In 1985, the CDFG closed the entire range of the southern sea otter to set-nets in depths of less than 15 fathoms. From 1983 through 1989, the number of southern sea otters detected during spring counts increased from 1,277 to 1,856.

Southern sea otters continued to die from entanglement in nets, although in reduced numbers as the population size began to increase again following the 1985 closure. In 1991, the State of California closed waters less than 30 fathoms in depth to fishing with nets. The population size continued to increase until 1995, when the number of southern sea otters reached 2,377 (Service 1995a). Since that time and up until the most recent spring count in May 2000 , the numbers of animals detected during surveys had steadily declined to a low of 2,090 in the spring of 1999. (See attached table.) During the spring of 2000, 2,317 southern sea otters were counted. This number is within 60 of the number of southern sea otters that were counted in 1995, the last year the count was higher than the previous year. However, as noted previously in this biological opinion, the numbers of southern sea otters detected in any given count can be affected by numerous factors. Additionally, although the number of southern sea otters counted generally increased from 1982 through 1995, the number of individuals counted decreased in 1983, 1984, and 1990. Because of the large number of southern sea otters observed in the most recent count, the 3-year running average for the spring counts from 1998 through 2000 also indicates an apparent reversal of the recent decline in numbers. In summary, we do not view the information from the spring 2000 count as sufficient evidence to permit a conclusion that the recent decline of the southern sea otter population has been reversed; we could reach that conclusion based on the results of counts over the next few years. For these reasons, this biological opinion adopts a conservative approach and continues to view the population of the southern sea otter as being in a declining trend.

As stated above, the overall population of southern sea otters has generally increased during the 20th century, although there have been periods of population decline during this period. However, population trends and the extent of the range of the southern sea otter have not paralleled each other in recent decades. That is, the overall range of the southern sea otter has not retracted in response to declines in numbers of individuals. The attached map of the range of the southern sea otter during the 20th century depicts changes in the range over time (Service 1987a). Table 2 depicts the changes in the numbers of individuals over time.

From the remnant colony at Bixby Creek, southern sea otters have expanded much farther south than north. By the late 1980s, the expansion of southern sea otters to the north had essentially stopped at Point Ano Nuevo. In 1998 and 1999 more sea otters were observed in the area north of Point Ano Nuevo during range-wide surveys, with a high of 47 counted between Point Montara and Point Ano Nuevo during the spring 1999 survey. Fewer individuals were counted in

this area in the spring of 2000, but the exact number was not available at the time this document was completed (Hatfield email 2000). By 1995, southern sea otters were commonly observed as far south as Point Arguello at Vandenberg Air Force Base in Santa Barbara County. Based on observations of tagged individuals, at least some of the southern sea otters at Purisima Point, which is north of Point Arguello, had moved into this area after being translocated to San Nicolas Island.

As mentioned previously, about 100 southern sea otters moved south of Point Conception in the spring of 1998. The number of southern sea otters in the area decreased greatly during the summer. However, by January 1999, the number had increased to 152. On October 13, 1999, one dependent and three adult southern sea otters were observed at San Miguel Island during an aerial survey of the northwestern portion of the management zone; an additional southern sea otter was found along the mainland. These were the only individuals detected in the management zone (Service 2000). As of February 2000, we were unaware of any southern sea otters along the mainland coast south of Point Conception (Sanders pers. comm. 2000). In April 2000, 29 southern sea otters were found during a survey conducted by boat in the area from Cojo Anchorage to Point Conception (Sanders pers. comm. 2000). On May 15, 2000, the CDFG detected 78 southern sea otters in the management zone during aerial surveys, roughly between Point Conception and Refugio State Beach (Harris email 2000)

Twenty-one independent southern sea otters were detected at the island during the most recent survey counted; two pups were also observed (Sanders pers. comm. 2000). Counts have occurred every 2 or 3 months at the island for a number of years and data from these counts indicate the population has not changed substantially since July 1990, ranging from a low of 6 animals to a high of 21. The last three counts, in August and October 1999 and April 2000, yielded the highest number of southern sea otters since 1990. The lack of growth of the colony has been primarily attributed to poor post-weaning survival (that is, pups that reach adulthood) (Service 1995b).

The BRD has analyzed the number of carcasses found to determine whether relative mortality patterns varied during periods of population increase and decline. BRD found that mortality was roughly constant at 5 percent per year during periods of population increase but was “somewhat” higher during periods of decline. This information indicates that mortality increased during the periods of decline (i.e., the early 1980s and 1995 to 1999). Prior to 1980, data from southern sea otters found stranded on beaches was not being analyzed.

Between 1968 and 1989, the cause of death could not be determined for 56 percent of the 1,680 southern sea otter carcasses examined. Between 1982 and 1985, 29 southern sea otters were known to have drowned in gill and trammel nets; however, because only a small portion of the nets were sampled, the actual number of individuals that drowned was likely larger. Eleven southern sea otters (0.7 percent of 1,680 carcasses) are known to have drowned as a result of being tangled in fishing lines. The number of southern sea otters that die from drowning after being entangled in fishing gear is likely to be higher than we can demonstrate. Drowning is nearly impossible to detect in necropsies; all or nearly all of the carcasses for which drowning was attributed as the cause of death were either taken from nets or had net fragments attached to

them. Shooting was known or suspected to be the mortality factor in 77 of 1,680 carcasses (4.6 percent) during this time period. Great white sharks, killer whales, and bald eagles are known to kill sea otters. In California, among these species, only great white sharks are known, from evidence of bite marks and scrapings on bones, to attack southern sea otters. Between 1968 and 1989, 195 of 1,680 deaths (11.6 percent) of southern sea otters were likely due to shark attacks.

The potential also exists that southern sea otters are being killed in fish traps and in gill and trammel nets. The live finfish trap fishery expanded in central California during the mid-1990s; in 1999, the trap fishing effort in the southern half of the range of the southern sea otters decreased, possibly as a result of new regulations enacted by the CDFG (Hatfield and Estes 2000). Experiments conducted at the Monterey Bay Aquarium demonstrated that southern sea otters will enter fish traps and can become trapped in them (Hatfield and Estes 2000). However, the only reports of mortality of southern sea otters in fish traps are unconfirmed.

Forney *et al.* (in press) estimated that set gillnets in the Monterey Bay area killed between 17 and 125 southern sea otters from 1995 through 1998. Forney *et al.* attribute the elevated mortality estimates to the increased use of set gillnets in the Monterey Bay area and the documented use of deeper waters by southern sea otters during the late 1990s. Although no take of southern sea otters resulting from entanglement of otters in set gillnets was documented during the period from 1995 through 1998, no monitoring of potential sea otter/gillnet entanglement was undertaken during this period. Forney *et al.* notes that the highest estimate of 125 individuals taken is likely an overestimate because the maximum number of nets that can be set per day are usually not used. Since April 1999, one southern sea otter is known to have died in set gillnets in Monterey Bay (National Marine Fisheries Service [NMFS] 1999).

In 1998, three dead southern sea otters were found with wounds that were caused by the propellers of boats; one additional individual had wounds that may have been caused by a propeller. Three of these individuals were found in the vicinity of Elkhorn Slough in Monterey County and the other was near Morro Strand in San Luis Obispo County. No such wounds were observed in 1999. We have no additional information to indicate whether mortality from collisions with boats is a substantial cause of mortality.

Riedman and Estes (1990) also discuss the factors that may affect the size of the population of the southern sea otter. Because emigration from the parent range seems to be low and annual recruitment appears to be similar to that of populations in Alaska, they conclude that mortality resulting from density-independent or density-dependent factors has caused the slower growth rate of the southern sea otter. Estes *et al.* (1986 in Riedman and Estes 1990) believed that starvation, which is a density-dependent factor, was not an issue in California because the amount of time that southern sea otters spent foraging was equivalent to that observed in below-equilibrium densities elsewhere, unoccupied habitat occurred at both ends of the range, and the mortality caused by set-nets was estimated at 7 or 8 percent of the total population each year (Wendall *et al.* 1985 in Riedman and Estes 1990). Ralls and Siniff (1988 in Riedman and Estes 1990) disagreed with this conclusion because they observed that "juvenile females in the central part of the range spent more time foraging and experienced higher mortality than other age and sex classes," with the exception of adult males, which experienced the lowest rates of survival.

Riedman and Estes (1990) speculated that density-independent factors may be more important at the northern and southern limits of the range where entanglement in set-nets, shark attacks, and shooting are more common than in the central portion of the range.

General Ecology

Unless otherwise noted, the following information on the ecology of the southern sea otter is from Riedman and Estes (1990).

The sea otter is the second largest member of the family Mustelidae; however, the only marine mammal which is smaller is the South American marine otter (*Lutra felina*). Southern sea otters can weigh up to 40 kilograms and attain lengths of 140 centimeters. Males are larger than females. Southern sea otters are estimated to live a minimum of 11 years; one female was known to be 15 or 16 years old.

Unlike most other marine mammals, sea otters have little subcutaneous fat; they depend on their clean, dense, water-resistant fur for insulation against the cold. Sea otters also maintain a high level of internal heat production to compensate for the lack of blubber. Consequently, their energetic requirements are high and they are estimated to consume an amount of food equivalent to 23 to 33 percent of their body weight per day. Contamination of the fur by oily substances can destroy the insulating properties of the fur and lead to hypothermia and death. The loss of the insulating properties of the fur greatly heightens the adverse effects of an oil spill on southern sea otters and is one of the reasons that increased tanker traffic and the potential for oil spills was considered in the listing of the taxon.

Most southern sea otters remain within 2 kilometers of shore. The density of southern sea otters within most of the population's range is most likely related to substrate type; rocky bottom habitats support an average density of five individuals per square kilometer; areas with sandy bottoms support an average of 0.8 individual per square kilometer.

Southern sea otters generally forage in both rocky and soft-sediment communities in water depths of 25 meters or less, although individuals occasionally will move into deeper water. Rocky habitats that are topographically heterogeneous and support kelp forests are likely to support the greatest diversity and abundance of sea otter food resources, which include abalone, rock crabs, sea urchins, kelp crabs, clams, turban snails, mussels, octopus, barnacles, scallops, sea stars, and chitons.

Because of their ability to eat large quantities of marine invertebrates, sea otters play an extremely important role in the nearshore marine community. Their mobility, forelimb dexterity, and ability to crush large invertebrates, either with their teeth or rocks, enable sea otters to prey on virtually any invertebrate of any size. The only refuges for invertebrates from predation by sea otters appear to be in deep holes and crevices in rocky areas or very deep water. The energetic inefficiency of consuming small prey items may also protect invertebrates of small size. Shallow water may also provide refuge to invertebrates; southern sea otters failed to find an "unusually

dense concentration of Pismo clams [that occupied a very narrow band of habitat in the high intertidal (zone)] ... for several years" (CDFG 1999, comment 48 on the draft biological opinion).

Numerous reports exist of sea urchin, crab, and clam populations declining once sea otters enter an area. Generally, only more widely scattered, well-hidden, and smaller individuals remain after sea otters become established. Other studies have shown that populations of invertebrates begin to recover once sea otters have left a site.

The available information suggests that sea otters greatly influence invertebrate communities. They require large amounts of food and their mobility, crushing dentition, use of tools, and their highly developed sensory and motor functions combine to make sea otters efficient predators (Riedman and Estes 1990). Although other factors are also likely to be involved, kelp forests appear to grow profusely in suitable areas where sea otters reduce the number and size of sea urchins. In turn, kelp forests provide shelter and food for various species of fish, which become established in areas where kelp forests regenerate. In the western Pacific Ocean and Alaska, fish which have increased in abundance in response to the growth of kelp forests have become an important part of the sea otter's diet. Other predators of sea urchins, such as fish and starfish, and stochastic events, such as severe storms, may also influence the community dynamics of kelp forests. Fish are not an important component of the southern sea otter's diet in California.

The patterns in which southern sea otters move throughout the year are complicated and vary between males and females. Generally, the home ranges of southern sea otters consist of several heavily used areas with travel corridors between them. Animals often remain in an area for a long period of time and then suddenly move long distances; these movements can occur at any time of the year.

Male southern sea otters have larger home ranges than females. Compared to males, most female southern sea otters are more sedentary. Occasionally, females travel long distances; 3 tagged adult females routinely moved between Monterey and Santa Cruz, a distance of 40 to 50 kilometers, for over 4 years. Juvenile males move further from natal groups than juvenile females; aggressive behavior exhibited towards the juvenile males by older males may be partially responsible for their more extensive travels. Most male southern sea otters leave the central portion of the range and travel to its southern end during the pupping season, which occurs in the winter and spring (Riedman and Estes 1990).

Several theories have been presented for the differences in movements between the sexes. Males may accrue some social benefit from gathering in male social groups. Widely traveling males may have greater opportunity to find females; on the other hand, more sedentary females may derive some benefit from expending less energy traveling and being more intimately familiar with localized food resources. Finally, males which move to the periphery of the species' range may benefit from abundant food resources in areas where southern sea otters do not occur year-round. These seasonal trips to the edges of the range may also be attempts to establish new home ranges. Also, increased competition for suitable territories and the reduced number of estrous females may be responsible, at least in part, for the migration of males to the southern end of the range (Riedman and Estes 1990).

Jameson (1998) notes that adult male sea otters are territorial; they exclude juvenile and subordinate males but females move freely among territories. Generally, southern sea otters occupy territories on a seasonal basis. During the winter and spring, males leave their territories and join male groups that also include juvenile and subordinate males. Maintaining territories during the winter and spring may not be profitable for male southern sea otters because of the reduced chance of encountering estrous females. Additionally, winter storms may reduce the availability of resting sites in kelp; males could then seek shelter in other areas with females or move to new areas, such as at the edges of the range, where food resources may not be as limiting. Additionally, the early results of research with sea otters in Washington shows that testosterone levels in territorial males are three to four times higher than in non-territorial males. Consequently, the absence of females and the presence of greater food resources at the southern edge of the southern sea otter range may seasonally reduce intra-specific stress. This pattern of movement may not be universal throughout the southern sea otter's range. Some territorial males near Monterey appear to maintain their territories year-round (Riedman and Estes 1990). This may be due to environmental differences between the study areas.

Health of the Population

The BRD concludes that the incidence of infectious disease may have been high throughout this century and that disease could be the responsible agent for the southern sea otter's relatively slow rate of population growth. The BRD has found that the rate of infectious disease has not increased since 1992, except for the incidence of acanthocephalan parasites (BRD 1998). However, the general rate of infection seems to be greater than would be expected in a wild population (Thomas and Cole 1996) and it may account for the slower growth rate of the southern sea otter population in relation to populations elsewhere. Thomas and Cole (1996) found that the larvae of acanthocephalan parasites (*Polymorphus* spp.) were aberrantly migrating through the intestinal wall, allowing bacteria to enter the abdominal cavity, and causing peritonitis. This condition was diagnosed in 27 carcasses examined by the National Wildlife Health Center between 1992 and 1996; most of the cases occurred in pups or juveniles. They concluded that the frequency of infections and of migration by these parasites from the intestine had increased over the 5-year period of the study.

The southern sea otter does not appear to be a suitable host because no egg-bearing individuals of the parasite, *Polymorphus* spp., have been found. Sea birds, including gulls, scoters, and sea ducks, prey on crabs which contain the parasites; eggs are passed from the birds to the ocean via feces. Southern sea otters may become infected by eating the crabs or possibly directly through contact with eggs in sea water. The increased prevalence of the parasites could be related to increased numbers or changes in distribution of sea birds; changes in behavior of southern sea otters could also increase exposure to the parasite. The increased migration of larvae of *Polymorphus* spp. from intestinal tracts could be related to decreased resistance to disease of the southern sea otters that are infected. Another potential explanation is that the ongoing range expansion of the of the southern sea otter has brought a higher proportion of the population into proximity of sandy bottom habitats where the definitive host of *Polymorphus* lives.

Seventeen of the southern sea otters examined by Thomas and Cole (1996) likely died from protozoal encephalitis caused by *Toxoplasma gondii*. Most of these individuals were adults or subadults. The typical infectious stage of the protozoan is usually found in cat feces. In humans, infections usually occur in very young or old individuals or in those with impaired immune capabilities. Prior to this study, this disease had not been observed in southern sea otters. The mechanism by which *Toxoplasma gondii* is transmitted to the southern sea otter is unknown but the protozoan may be entering the ocean in runoff from beach soils or sewage effluent.

Thomas and Cole (1996) also reported eight cases of coccidioidomycosis, which is caused by the fungus *Coccidioides immitis*. All of the affected individuals were adults or subadults. In all cases, multiple organs were affected by the disease, which is also called Valley fever. The method by which this disease was transmitted to southern sea otters is unknown.

Various bacterial infections were responsible for the deaths of an additional 23 southern sea otters examined by Thomas and Cole (1996). All of the affected individuals were adults or subadults. The causes of the infections were likely inhalation or trauma, but direct transmission between individuals would be unlikely.

Recent analysis of water quality in southern California indicates that viruses are entering the marine environment through runoff from urbanized areas (Cone 1999). We are unaware of any incidence of such viruses affecting the health of southern sea otters. However, because human swimmers have become sick after swimming in contaminated water and the level of urbanization is generally increasing in portions of the range of the southern sea otter, the potential exists for viruses to affect this taxon.

An examination of the environmental baseline for the southern sea otter must also consider the potential effects of environmental contaminants on the status of the species. Sources of potential environmental contaminants may be natural or anthropogenic. California's Coast Range contains abundant geologic sources of mercury and has a long history of mercury mining and associated contamination. This natural source of mercury and any increased availability of mercury associated with mining occur in the headwaters of streams that discharge into the range of the southern sea otter.

Riedman and Estes (1990) conducted a review of the presence of contaminants in the environment and their effects on sea otters; they note that adverse effects of environmental contaminants had not been documented although various types of materials occur in tissue samples taken from sea otters. Riedman and Estes (1990) note that some workers found seasonal variation in the levels of pesticide residues; residues were lowest in southern sea otters that died between May and August and highest in animals dying between January and April. The least and greatest amounts, respectively, of runoff from agricultural fields occurs during these periods. Another general trend is that the amount of cadmium, copper, iron, mercury, and zinc residues in the liver or kidneys increased with the size of the southern sea otter; conversely, magnesium and silver residues in the liver were lower in southern sea otters under 100 centimeters in length. Different methods of analysis may have contributed to at least some of these differences.

Southern sea otters consume as much as 35 percent of their body weight per day. This high forage rate leaves them potentially vulnerable to contaminant loading through the intake of food. Because they forage close to the coast and, consequently, to elevated discharges of mercury from the Coast Range, the southern sea otter is at risk of dietary exposure to this metal. Additionally, southern sea otters obtain a portion of their water needs from sea water. They may also ingest inorganic mercury in this manner.

Elkhorn Slough, which receives runoff from local farmlands and a portion of the Coast Range and then flows into Monterey Bay, contains elevated levels of mercury (Service and NMFS 1998). Livers collected from southern sea otters found dead at this location had a maximum mercury concentration of 60 milligrams per kilogram [mg/kg]) (Mark Stephenson, pers. comm., 1998). Wren (1986) suggested that the normal mercury concentration in river otter (*Lutra canadensis*) livers was four mg/kg. Forty-five percent of 125 southern sea otter livers examined for mercury had concentrations greater than what may be the ambient concentration for river otters (Service and NMFS 1998). Other coastal drainages, such as San Simeon Creek, also contain elevated levels of mercury, most likely as a result of historic mercury mining. The extent to which mercury has contaminated the offshore environment is not known.

Acute mercury poisoning in mammals is primarily manifested in damage to the central nervous system, sensory and motor deficits, and behavioral impairment. Animals initially become anorexic and lethargic. Smaller carnivores are more sensitive to toxicity from methyl mercury, the organic form in which mercury can be found, than larger species as reflected in shorter times of onset of toxic signs and time to death. To date, information on the levels of mercury or methyl mercury to which southern sea otters are exposed is unavailable. Additionally, the ability of southern sea otters to detoxify methyl mercury is not known, but it could protect individuals from the adverse effects of increased methyl mercury loads. The CDFG and Service are currently undertaking a risk assessment to determine the level of effect that mercury and other contaminants may be having on the southern sea otter.

Although specific research has not been conducted on the southern sea otter, other species within the mustelid family, such as the mink (*Mustela vison*) and ferret (*M. putorius furo*), are extremely sensitive to several types of organochlorines (Bacon *et al*. 1999) Minks exhibited complete reproductive failure when exposed to polychlorinated biphenyl (PCB) levels as low as 0.64 part per million (ppm) in their food. This exposure caused PCB levels in the livers to reach 1.2 ppm; southern sea otters have been found with liver PCB levels greater than 1.2 ppm. Decreased birth rates, growth rates, and survival of kits were among the symptoms that minks developed when exposed to PCBs. This information may suggest a connection between the levels of PCBs found in southern sea otters and their high rate of pre-weaning mortality (Jarman *et al*. 1996).

PCBs and dichlorodiphenyltrichloroethane (DDT) have been shown to suppress immune potential in fish and mammals. The levels of DDT found in southern sea otters do not seem to be toxicologically significant (Bacon *et al*. 1999). Levels of other individual organochlorine pesticides were also reported by Bacon *et al*. to be low in the southern sea otter. In general, organochlorine levels have decreased substantially in the California coastal ecosystem over the past several decades. For example, PCB levels in California sea lions (*Zalophus californianus*) in

central and southern California have declined by well over an order of magnitude (Lieberg-Clark *et al.* 1995) during this period.

Tributyltin and its degradation products (BTs) have been found in tissues of dead southern sea otters (Kannan *et al*. 1998). This material was used extensively as an antifouling agent in marine paints. Many countries introduced regulations on the use of these materials in the 1980s. However, BTs continue to be found in areas frequented by large vessels; these chemicals also persist in the environment for several years. Only large vessels are currently allowed to use paints containing tributyltin. Kannan (*et al*. 1998) notes that large harbors, such as at Monterey which are used by ships painted with tributyltin, continue to exhibit "ecotoxicologically significant butyltin contamination."

BTs products have been shown to suppress immune potential in fish and mammals. Consequently, these animals become more susceptible to microbial infections. Kannan *et al*. (1998) demonstrated that southern sea otters dying from infectious diseases contained greater concentrations of BTs than animals that died as a result of trauma.

The synergistic effects of these chemicals, even those found at concentrations sufficiently low that they would not alone cause concern, and parasites must also be considered. In addition to the previously mentioned study by Kannan *et al*. (1998), Nakata *et al*. (1998) report that southern sea otters that died from infectious diseases and other causes, such as neoplasia, emaciation, and esophageal impaction, contained greater concentrations of PCBs and DDTs. Although absolute correlations among various pollutants and diseases and mortality have not been developed, the widespread presence of a variety of contaminants in southern sea otters and the increasing prevalence of infectious disease warrant further examination and consideration in evaluating the status of the taxon.

Southern sea otters have not experienced any substantial adverse effects from oil spills over the last several years. Currently, 19 oil production platforms are located in the Santa Barbara Channel and the Santa Maria Basin. The Minerals Management Service is currently evaluating additional exploration for crude oil in these areas. As a result of various activities associated with exploration for and development of crude oil resources, six or seven exploration wells may be drilled from existing platforms or a single mobile drilling unit, approximately 10 production wells may be drilled from existing platforms, four to six new platforms may be constructed on the outer continental shelf, and six to eight existing platforms on the outer continental shelf may be decommissioned (Minerals Management Service 2000, Service 2000). Any oil that is produced as a result of this exploration would be moved to shore by pipelines; one new pipeline may need to be constructed (M. Pierson pers. comm. 2000). In general, pipelines pose less risk of oil spills than do tankers.

Reproduction

Southern sea otters mate and pup throughout the year. The northern and southern portions of the population seem to exhibit different mating peaks. A peak period of pupping occurs from January to March; a secondary pupping season occurs in late summer and early fall. Pupping is seasonally

uniform in the Monterey Bay area (Riedman *et al.* 1994). Parental care is provided solely by the female.

Southern sea otters have successfully reproduced at San Nicolas Island from the beginning of the translocation program. As of April 2000, 56 pups are known to have been born at the island. Seven pups were observed with their mothers for fewer than 120 days and probably did not survive to weaning. Fifteen pups are known to have been with their mothers for a long enough period to likely survive to weaning, while the fate of the remaining 34 is unknown (Hatfield email 2000). Predation of young southern sea otters is not known to be a factor; however, great white sharks do occur in the area. Incidental take by trap fisheries is another possibility. Large numbers of fish traps have been set around San Nicolas each season, but no documented deaths of southern sea otters can be attributed to these fisheries at San Nicolas Island to date. Southern sea otters are known to enter such traps in captivity; an effort to monitor traps in the field was attempted but observers had difficulty in finding fishing vessels, possibly as a result of the decreased fishing activity (Estes 1999, Hatfield and Estes 2000).

Conservation Needs of the Species

The initial recovery plan for the southern sea otter was approved in 1982. In 1989, the Service formed another recovery team for the southern sea otter to revise the 1982 recovery plan. Draft recovery plans were developed and circulated for public comment in 1992 and 1995. A revised draft recovery plan was circulated for public comment in January 2000 (Service 2000).

The draft recovery plan (Service 1995a) identified two objectives that needed to be met to delist the southern sea otter. First, the range of the southern sea otter and the number of individuals would need to increase to reduce the risk of a single catastrophic event reducing the population to below a level that is viable. Second, the risk to southern sea otters that an oil spill would occur within their range should be decreased.

With regard to the latter goal, the Monterey Bay National Marine Sanctuary and U.S. Coast Guard, with the assistance of a stakeholder task force, drafted a proposal to establish a vessel routing system along the central California coast. This system proposes that different types of vessels, such as oil tankers, dry cargo vessels, and barges, would be assigned to specifically designated lanes based on the potential risk of oil spills contacting the shore should an accident occur and the emergency response time that would be necessary to provide assistance to a disabled vessel. If approved by Congress, this traffic routing system would reduce the risk of vessel collision and grounding and reduce the potential oil spill risk to southern sea otters. This proposal remains pending**.**

The 1995 draft recovery plan identified three actions that needed to be conducted to achieve recovery of the southern sea otter population. First, the population and habitat of the southern sea otter should be monitored to determine the number of individuals, the rate of growth, and range expansion. Second, the population should be protected and the potential limiting factors related to human activities, such as those associated with oil production and transport and possible oil spills, should be reduced or eliminated. Finally, research into the factors currently limiting the growth

rate of the southern sea otter population should be conducted to refine recovery goals for future management.

The draft recovery plan acknowledged that the translocation program had not met its objectives. It further noted that, although the colony at San Nicolas Island may eventually increase in size, its long-term survival is questionable. Finally, it recommended against additional translocations and stated that recovery of the southern sea otter would occur more rapidly if the existing population is allowed to expand its range and population size.

A primary goal of the translocation was to establish a colony of southern sea otters sufficiently far from the mainland that the potential of a human or natural catastrophe affecting the entire population would be reduced. A specific concern was the risk of oil spills. Current modeling of oil spills along the central coast of California indicates that a large spill could, in fact, affect both the mainland coast and San Nicolas Island. Experience with the *Exxon Valdez* has shown that measures to contain the spill and rehabilitate sea otters are likely to be ineffective in protecting the population. Additionally, information gained from the *Exxon Valdez* spill indicates that mortality of sea otters could continue to occur for a long period of time after the spill. Both of these factors decrease the importance of a second colony of southern sea otters at San Nicolas Island when a mitigating measure for the existence of that colony is maintenance of the management zone. The recovery team concluded that the most appropriate measure to protect southern sea otters from a catastrophic event would be a large number of individuals over a large area of suitable habitat.

In the most recent draft of the recovery plan (Service 2000), the recovery team states that coastal vessel traffic should be regulated or managed in a way that will minimize the risk of accidents in and near the range of the southern sea otter. The recovery team also states that the population of the southern sea otter must increase in number and range. Specifically, the draft recovery plan recommends evaluating the causes of mortality, developing and implementing a plan to reduce the probability of an oil spill, developing and implementing plans to reduce or eliminate the take of southern sea otters, and evaluating the assumptions used to estimate the population level at which the taxon would be considered to be recovered. This most recent draft recovery plan notes that the translocation program has not been as successful as was desired and that cessation of the containment program is considered the primary action for promoting the recovery of the southern sea otter.

At the time the translocation program was planned, the Service assumed that sufficient habitat existed north of Point Conception to allow southern sea otters to reach the population levels indicated in the recovery plan; continued expansion to the north of the existing range was also a reasonable assumption. Considering the rates of growth in populations and numbers of individuals of sea otters elsewhere, the Service's predictions and expectations regarding the growth rate and size of the southern sea otter population were not unrealistic. However, for reasons that have yet to be fully determined, the growth of the parent population has not met expectations and is currently in decline, and expansion to the north has generally been slower than to the south. Twenty southern sea otters moved north of Point Ano Nuevo in the spring of 1998; these animals were observed in small groups or scattered individuals. Prior to this event, expansion to the north

had almost ceased completely. In the spring of 1999, 47 southern sea otters were observed north of Point Ano Nuevo.

The southern sea otter had been expanding its range southward since before the onset of the translocation program. The Service had predicted that the parent range of the southern sea otter would reach the management zone by approximately 2001 to 2006, although the CDFG had predicted a more rapid movement. The annual exploration by male southern sea otters was likely to keep expanding the boundaries of the range as these individuals explored new areas. As the level of protection afforded the population increased (i.e., initial protection from hunting and later from various types of nets), most biologists expected the southern sea otter to expand its range both north and south. The slower movement to the north is less explainable than the expansion to the south. We are unsure why the northern expansion slowed around Point Ano Nuevo for a period of time because resources to the north of this area do not appear to be substantially different than those to the south.

The southern movements that occurred in the last 2 years are a continuation of the range expansion of the southern sea otter. As the range of the southern sea otter becomes larger, the likelihood that a single stochastic event could cause irreparable damage to the population decreases. Because of the generally slower movement of southern sea otters to the north, their ability to expand the range to the south increases in importance.

Additionally, the larger range may allow southern sea otters to exploit food resources within the range more sporadically. That is, invasions by southern sea otters and subsequent declines in prey base could be followed by decreased presence of southern sea otters and recovery of the food resources over greater areas.

Finally, many of the documents concerning the translocation program, the experimental population, and the donor population discuss the potential carrying capacity of habitats; models estimate the number of southern sea otters that can inhabit a given area based on its biotic and abiotic characteristics. The numbers provided by such models are estimates, based on our understanding of the natural factors that affect the abundance of southern sea otters. Our understanding of these factors is incomplete, but we are aware that the factors change over time (e.g., El Niño events and changes in predator-prey balances). The impact of human activities, including harvesting of ocean resources and pollution, also affects carrying capacity in ways that are not well understood.

Because human activities affect the carrying capacity of the southern sea otter's habitat, whether its carrying capacity has been reached, as several commenters on the draft biological opinion contend, is irrelevant. The estimates of the numbers of southern sea otters that are necessary to achieve recovery cited in the recovery plan are intended to maintain a sufficient population to ensure protection from genetic bottlenecks and natural fluctuations in habitat quality. Simply stated, the conservation needs of the southern sea otter are likely greater than the quality and quantity of habitat currently provided within the parent range; human activities are likely to be at least partially responsible for this situation.

Summary

The population of southern sea otters has declined over the last 4 or 5 years. The reason or reasons for the decline cannot be fully explained to date. The incidence of infection by acanthocephalan parasites appears to be increasing and southern sea otters are contaminated with potentially harmful levels of environmental contaminants. Both of these factors are likely indirectly associated with the growth of human populations along the range of the southern sea otter. Changes in the location of set-nets, particularly in the area around Monterey Bay, could be causing greater mortality of southern sea otters than was previously thought; a coastal pot fishery for live fish traps has rapidly developed along the central coast since the mid-1990s and southern sea otters are known to become entrapped in fishing gear. The carrying capacity of the marine environment upon which the southern sea otter depends may be changing, as a result of natural or human-induced processes or a combination of both. For example, the recent El Niño event may have affected the number of southern sea otters. All of these factors, either individually or synergistically, may play some role in the decline of the sea otter population.

In conclusion, the overall condition of the southern sea otter is one of decline and instability. One positive aspect of the population's overall ecological condition appears to be the subspecies' continued expansion into the southern portion of its former range. The best available information indicates that continued, passive expansion of the range of the southern sea otter is necessary for its survival and recovery.

EFFECTS OF THE ACTION

Maintenance of the existing management zone south of Point Conception will have both direct and indirect adverse effects on the survival and recovery of the southern sea otter. Direct effects involve the fates of the individual animals that would be captured and moved; the indirect effects are related to the artificial restriction of the range of the taxon and the impacts that the southern sea otters released into the parent population would have on the resident animals.

The capture of large numbers of southern sea otters in the management zone and their transport and release into the parent population may result in the deaths of individual animals. To date, 12 southern sea otters are confirmed to have died as a result of being captured, held, and transported during containment and translocation activities. A brief summary of the mortalities is contained in the "Previous Reviews of the Translocation Program" section of this biological opinion. Improvements in the techniques used during capture and removal of southern sea otters may assist in reducing the number of deaths; also, the additional procedures involved with translocating animals to San Nicolas Island, such as implanting radio transmitters in some individuals, may have caused a higher level of mortality than that associated with management zone activities. However, at this time, the Service does not possess any new information on capturing and moving animals that is likely to result in a lowered mortality rate. One factor that was intended to reduce mortality during translocation activities was that southern sea otters being considered for translocation to San Nicolas Island were screened carefully to try to ensure they were physically able to withstand the stress, and only the individuals that were considered suitable were selected. During a containment program, all individuals would be captured and moved, without regard to their health.

As noted previously in this biological opinion, approximately 73 southern sea otters moved to San Nicolas Island subsequently could not be found; their fates are not known. The Service is also unable to determine the fates of many of the southern sea otters captured as part of the containment effort. The potential exists that a large percentage of these animals perished as a result of being captured and moved. If that is the case, the direct adverse effects of capturing and moving animals would be severe. The loss of any animals would accelerate the recent decline in the population. If the loss involved a percentage as high as that for which the fates are undetermined, the decline of the population would be greatly accelerated. Given that southern sea otters may continue to move into the management zone in the future, the adverse effects of losses from containment, considered over a longer time frame, would likely have substantial consequences for the survival and recovery of the subspecies. Also, because southern sea otters have a strong tendency to return to their point of capture, the potential exists that the same individuals may need to be captured and moved more than once; this repeated handling would increase the likelihood of mortalities.

Continuation of the containment program will also restrict the natural range expansion of the southern sea otter. Restriction of the southern sea otter's range increases the likelihood that oil spills and stochastic events would affect a greater percentage of the individuals in the population. The existence of the management zone precludes the ability of the southern sea otter to expand its range to the south and thereby reduce these risks. The recovery team for the southern sea otter notes that the "primary action for promoting the recovery of this population at this time is the cessation of the 'otter-free-management zone' in the southern California Bight. Without such a change in management, the current population decline could worsen" (Service 2000).

The following information on sea otter territoriality and social behavior is from Garshelis *et al.* (1984.) unless otherwise noted and provides background regarding the importance of the sea otter's social system. In Alaska, territorial male sea otters patrol their territories in a highly visible manner and usually repulse trespassing individuals without actual contact or after a brief fight. Maintaining an appropriate territory is likely important for males because it may increase the likelihood of successfully mating. Females may be attracted to territories if food resources are particularly good. Another important factor in the attractiveness of territories to sea otters, at least in Alaska, is the presence of sheltered resting areas; sea otters expend less energy in sheltered sites. Male sea otters used the same or nearly the same territories during successive breeding seasons. Interestingly, sea otters do not universally defend territories; territorial defense was not observed in sea otters in the Aleutian Chain in Alaska, but territoriality does occur in California's southern sea otters (Kenyon and Vandevere, respectively, in Caulkins and Lent 1975).

Garshelis *et al.* speculate that the long-distance movements from territories to areas at the edges of the range may be prompted by the greater abundance of food in these areas and further theorize that such movements may be common in all expanding populations of sea otters. These individuals may be attempting to determine whether new sites would be appropriate as breeding territories. The diminished food resources within an area where dominant males have secured territories may prompt non-territorial males to start long-distance movements.

The separation of most males from females during portions of the year are likely to benefit females. Garshelis *et al.* found that females attempting to feed are frequently interrupted by sexual interactions with males. Food stealing by males is also common. Females with pups generally avoided male groups; interactions with males resulted in the temporary separation of the pup and female which places the pup at risk. Jameson (1989) also reports that the seasonality of adult male southern sea otters, in areas where females maintain territories (females areas), is apparently related to the reproductive status of females in the population. More males were in the female areas when the maximum number of females were in estrous; males left the female areas and traveled to the ends of the range when they derived no benefit, in the form of reproductive opportunities, from being in the female areas. Additionally, the density of males is lowest in the female areas when the number of pups is the highest. This separation likely reduces negative interactions between males and female-pup pairs.

The movements of male southern sea otters are also related to kelp canopies (Jameson 1989). If kelp canopies are reduced by winter storms, males may lose their traditional resting sites. These males could remain in their normal territories where, without kelp, they would expend more energy while trying to rest. They could also move into more protected areas with females and pups, where they may encounter more limited food resources and increase the potential for agnostic encounters with other males at a time when estrous females are not common. Alternatively, males could move to another area where they reside in close proximity without exhibiting the territorial behavior that is manifested when estrous females are present.

Moving large numbers of males into the parent range, as would be required if the recent movement of large numbers of male southern sea otters into the management zone continued, is likely to disrupt the social structure of the parent population and reduce the survival and reproductive success of affected individuals. If animals from the south are moved back into the central portion of the range, the seasonal separation of females and most males would be disturbed. Various disruptions of the social system are also likely to occur as a result of the released males passing through the territories of female-pup pairs and resident males. Increased aggressive behavior is likely between the released males and territorial males; the increased aggression is likely to result in animals expending additional energy to maintain territories.

As noted previously in this biological opinion, a factor in the seasonal movement of male southern sea otters to the south is likely related to availability of food resources. The reintroduction of the released males into areas that they have left to seek, in part, greater food resources would likely place the released males and the resident animals in nutritional stress.

Jameson (1998) noted that testosterone levels in territorial males are three to four times higher than in non-territorial males. The greater hormonal levels in territorial males are likely to cause them to react aggressively toward southern sea otters from the management zone that are released in the parent range. A greater number of aggressive interactions would result in increased energy expenditures for the territorial males and possibly decrease their ability to maintain territories. Aggressive interactions with numerous territorial males may also increase physiological stresses on dispersing southern sea otters that have been captured in the management zone and released into the parent range.

Releasing additional male southern sea otters into areas when females are caring for pups is likely to have adverse effects on the female-pup pair. As described previously in this biological opinion, males steal food from females, disrupt their feeding, and occasionally cause them to be separated from their pups. The incidences of these behaviors would likely increase when additional males are released into female areas.

The adverse effects of an unnatural influx of male southern sea otters are likely to occur synergistically; that is, released and resident southern sea otters are likely to experience more than one of the circumstances described above. In combination, these effects would have greater impact on each individual than any single impact. An important point to consider is that southern sea otters are driven by their biological needs to separate seasonally; they are also adept at returning to areas from which they are removed. Consequently, the adverse effects described above would not be a one-time occurrence. The same effects would occur each season if the containment program is continued. Given the rapidity with which southern sea otters can travel, the potential exists that the same individuals would likely need to be captured repeatedly during a single season.

Members of the recovery team generally concur with this assessment. A subgroup of the team informed the Service that they believe the movement of large numbers of individuals would likely disrupt the social structure of animals in the parent range and increase the competition for food that may already be limiting that population. Their analysis also stated that the capture and movement of a large number of adult males would likely lead to numerous mortalities because of the sensitivity of this age and sex class to the stress of capture and removal (DeMaster 1998a). The subgroup concluded that these impacts are likely to exacerbate the recent population decline. They stated that euthanizing the individuals in the management zone or removing them to captive facilities would be less harmful to the overall population than moving them back into the parent population.

The direct disruption of the social system could possibly be reduced by moving these males to the extreme northern portion of the range. However, the consequences of locating additional male southern sea otters in the northern group could also result in increased aggressiveness and pressure on food resources. These individuals would also then re-enter the central portion of the range from the north and potentially cause disruption of the subsequent breeding season. Moving these animals back to a location immediately north of Point Conception would be unlikely to keep them from promptly returning to the management zone. Given the long-range movements and homing behavior exhibited by several southern sea otters during the translocation program, including containment, individuals moved from south of Point Conception are likely to return to that area in a relatively short time. Finally, numerous male southern sea otters moving through the range are likely to disrupt the social structure along the entire length of the area they travel.

Disruption of the social structure and increased competition for food would increase stress among individuals, leaving them increasingly susceptible to disease and the adverse effects of environmental contaminants. Increased stress could also decrease nutritional intake and lead to

decreases in the birth rate, poor survivorship of pups, and possibly death from malnutrition. Pups are more likely to be abandoned if their mothers undergo undue stress. Any one of these adverse effects would exacerbate the recent decline of the southern sea otter population; in combination, they may significantly exacerbate the decline.

Transporting individuals from the management zone into the parent range would artificially increase the density of southern sea otters within portions of the parent range. If southern sea otters disperse as a mechanism for surviving variable levels of food resources during portions of the year, this artificial crowding will likely cause at least some individuals to obtain less food than they optimally require. Insufficient nutrition leads to less reproductive success, lowered resistance to disease or parasites, or behavioral problems; in extreme cases, starvation could result.

Some potential exists to reduce the adverse effects of moving southern sea otters from the management zone into the parent range by scattering individuals that are being moved throughout the parent range, rather than releasing them at a single location. Such releases would result in less impact on local food resources and, therefore, less stress on resident southern sea otters than the release of dozens of individuals in one location. Disruptions of the social system would also likely be less because of the smaller number of individuals involved; however, the disruptions that would occur would now be spread throughout the range of the subspecies. The subgroup of the recovery team also addressed this issue and concluded that, given the current status of the taxon, moving even small numbers of southern sea otters would not be advisable (DeMaster 1998b).

Recent evidence, as discussed above in the “Status of the Species” section, indicates that infection by acanthocephalan parasites may be becoming more prevalent in southern sea otters and that some environmental contaminants may be compromising the health of the parent population. If southern sea otters are allowed to expand their range into areas they find suitable, they may encounter habitat where environmental contaminants pose less risk. Additionally, allowing the southern sea otter to continue to expand its range may result in a redistribution of the population in a manner that assists in reducing the incidence of disease. The Service also recognizes, however, that range expansion to the south may eventually pose additional difficulties for the southern sea otter. The heavily urbanized and industrialized areas of Ventura, Los Angeles, Orange and San Diego counties are likely to present obstacles to range expansion, such as depleted food resources, increased human activity, and decreased water quality, particularly as a result of pesticide residues.

The greater number of southern sea otters counted during the spring 2000 surveys does not alter the conclusions of our analysis. As we have noted previously, an increase in numbers during one survey does not provide sufficient data for the Service to conclude the recent population trend has been reversed. Additionally, if the number of individuals has increased, the capture and transfer of even larger numbers of southern sea otters into that increasing population would result in the same manner of impacts to the social structure outlined above. The potential exists that a containment effort while the population was increasing could have substantially greater adverse effects because more southern sea otters would likely be present, both in the management zone and in the parent range, and the adverse effects of capturing and moving these animals would be magnified. Finally, if southern sea otters are moving south of Point Conception because the carrying capacity of the habitat in the parent range has been reached, as some contend, the introduction of more animals

into an area that may no longer be able to support them would exacerbate competition for food and aggressive interactions.

Our analysis indicates that the capture of large numbers of southern sea otters in the management zone and their release into the parent range would likely have substantial adverse effects on the ability of this subspecies to survive and recover. We are unable to define the exact number of southern sea otters that could be moved from the management zone into the parent range before such substantial adverse effects are likely to occur. However, given that the goal of the containment program is to remove all southern sea otters from the management zone and southern sea otters are moving into the area south of Point Conception in large numbers, we have focused our analysis on the effects of a large-scale removal effort. If southern sea otters ceased moving into the management zone in large numbers, the Service would consider that information in its evaluation of the entire program, including the development of a subsequent biological opinion.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Several of the factors that could be considered cumulative effects, such as environmental contamination and disease, have been discussed previously in this biological opinion. The CDFG may be considering a closure of certain fisheries around the northern Channel Islands, which are generally south and east of Point Conception; if implemented, the closure could change the resource base and provide for additional forage for southern sea otters. The Service is unaware of other non-federal activities within the range of the southern sea otter which could cause substantial adverse effects to the taxon.

CONCLUSION

After reviewing the current status of the southern sea otter, the environmental baseline for the action area, the effects of the continuation of the containment program, and the cumulative effects, it is the Service's biological opinion that continuing the containment program and restricting the southern sea otter to the area north of Point Conception (which marks the current legal boundary between the parent range and the management zone, with the exception of the translocation zone at San Nicolas Island) is likely to jeopardize its continued existence. Critical habitat has not been designated for this species, therefore, none will be affected. This conclusion is based on the following reasons:

1. Reversal of the southern sea otter's population decline is essential to its survival and recovery. Continuation of the containment program will result in the capture, transport, and release of large numbers of southern sea otters from the management zone into the

parent population. These actions may result in the direct deaths of individuals and disrupt social behavior in the parent population to the degree that those affected individuals will have reduced potential for survival and reproduction. These effects will exacerbate the recent decline of the southern sea otter population.

2. Expansion of the southern sea otter's distribution is essential to its survival and recovery. Continuation of the containment program will result in the exclusion of southern sea otters from the area south of Point Conception. This effect will perpetuate the species' artificially restricted range and its vulnerability to the adverse effects of oil spills, disease, and stochastic events.

REASONABLE AND PRUDENT ALTERNATIVE

The regulations which implement section 7(a)(2) of the ESA (50 CFR 402.02) define reasonable and prudent alternatives as alternative actions, identified during formal consultation, that: (1) can be implemented in a manner consistent with the intended purpose of the action; (2) can be implemented consistent with the scope of the action agency's legal authority and jurisdiction; (3) are economically and technologically feasible; and (4) would, the Service believes, avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat. In consideration of these criteria, we conclude that, at this time, there are no reasonable and prudent alternatives that would avoid jeopardy to the species while still meeting the intended purpose of the containment program which is to remove southern sea otters from the management zone.

As noted previously in this biological opinion, the Service intends to undertake a comprehensive review of the translocation program under NEPA and evaluate: whether the program, or some of its components, should continue; modifications to the program; and termination of the program. As part of the NEPA process, the Service will identify and evaluate potential alternatives, if any, to the existing containment program that would avoid jeopardy to the species, while still meeting the purposes of containment. The Service may also propose modifications to 50 CFR 17.849(d), the regulations that implement the translocation program authorized under Public Law 96-625.

While we are evaluating the program through the NEPA process, the Service will continue to inform stakeholders and interested members of the public regarding the translocation program and any proposed changes to the program and provide information regarding the ecology of, threats to, and the recovery program for the southern sea otter, both in the management zone and in the parent range. We encourage all interested members of the public and stakeholder groups to participate fully in the review process.

If the final evaluation determines the translocation program to be a failure, the Service could choose either to terminate the translocation program, including its containment component, as allowed under 50 CFR 17.84, subject to compliance with the ESA; promulgate new regulations which propose different strategies (including redefining the management zone), provided they are consistent with the provisions of Public Law 99-625; or seek a change in the underlying statutory provisions. The Service intends to involve stakeholders and interested members of the public fully

in exploring alternative strategies to address issues regarding the translocation program, including containment, consistent with the needs of the southern sea otter to survive and recover, the ESA, MMPA and other applicable federal laws.

The Service will also consult with the Marine Mammal Commission, the CDFG, the recovery team, and the technical consultant team. Unless we receive new information on the status of the southern sea otter or on the likely effects of containment or the Service concludes that the containment program can continue in a manner that avoids the likelihood of jeopardy to the southern sea otter, we will not remove any southern sea otters from the management zone during the NEPA review period. At the conclusion of the NEPA process, the Service will determine whether its decision to continue, modify or terminate the translocation program requires re-initiation of formal consultation pursuant to section 7 of the ESA.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations promulgated pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

Public Law 99-625 provides statutory exemptions from the prohibitions against the take of southern sea otters resulting from the Service's actions to effect translocation and containment. In addition, the law provides exemptions for certain other activities that may affect southern sea otters in the management zone. Otherwise lawful activities within the management zone are exempted from the prohibitions against take.

Under the scenario envisioned by the Service, southern sea otters would remain in the management zone for at least some time into the future. Incidental take of these individuals in the management zone would not be prohibited by section 9 of the ESA. This lack of section 9 protection would expose these individuals to some risk of mortality and injury incidental to otherwise legal activities.

The Service is unaware of any legal activities currently being conducted within the management zone which pose a certain, high risk to southern sea otters. As mentioned previously, lobster traps have the potential to capture and drown southern sea otters but the Service has not documented any such incidents at San Nicolas Island; one such drowning occurred at Santa Cruz Island. We

recognize that some level of mortality or injury may occur as a result of these activities, but we are unable to quantify it. We expect that the level of mortality resulting from lobster traps in the management zone is likely to be less than that experienced by southern sea otters throughout the remainder of the parent range, at least in the immediate future. This expectation is based on the likelihood that food resources may be more abundant at the edge of the range and that the normally higher mortality levels associated with pupping and weaning will not occur in these groups of male southern sea otters.

The intentional killing or injury of southern sea otters within the management zone is not exempted from the prohibitions against take, because it is not an otherwise legal activity. Public Law 99-625 does not provide exemptions for any such activity. However, the potential exists that individuals could be intentionally killed or injured. The Service is unable to determine whether such take will occur or to quantify any level of such take. However, to reduce the likelihood that such take may occur, the Service will evaluate whether the presence of staff, including personnel from the Division of Law Enforcement, is needed in the management zone when southern sea otters are present. If such a presence is needed and subject to the availability of appropriated funds, the Service will provide funding and staffing to protect against illegal take of southern sea otters.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

The Service should endeavor to undertake or fund research that is focused on determining why the population of the southern sea otter is in decline. Decisions regarding the future management of this taxon could be made with more certainty if we understood why the southern sea otter population is in decline.

REINITIATION NOTICE

This concludes formal consultation on the continuation of the containment program for the southern sea otter, as directed by Public Law 99-625. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If you have any questions regarding this biological opinion, please contact Carl Benz of the Ventura Fish and Wildlife Office at (805) 644-1766.

Attachments

REFERENCES CITED

Bacon, C.E., W.M. Jarman, J.E. Estes, M. Simon, and R.J. Norstrom. 1999. Comparison of organochlorine contaminants among sea otter (*Enhydra lutris*) populations in California and Alaska. Environmental Toxicology and Chemistry 18(3):452-458.

Benz, C. 1996. Evaluating Attempts to Reintroduce Sea Otters Along the California Coastline. *In*: J.F. Watson and T.L. Root, eds. Endangered Species Update 13(12):31-35, The School of Natural Resources and Environment, University of Michigan, Ann Arbor.

Benz, C. 2000. Personal communication. Wildlife biologist. Ventura Fish and Wildlife Office, U.S. Fish and Wildlife Service, California.

California Department of Fish and Game. 1998. Recent sea otter range expansions. Note to interested parties. Morro Bay, California.

California Department of Fish and Game. 1999. Letter to Michael Spear, U.S. Fish and Wildlife Service, regarding the draft evaluation of the southern sea otter translocation program and the draft biological opinion on the containment program for the southern sea otter. Dated May 11. Sacramento, California.

Caulkins, D., and P.C. Lent. 1975. Territoriality and mating behavior in Prince William Sound sea otters. Journal of Mammalogy 56:528-529.

Cone. M. 1999. New tests show human viruses in beach waters. In: *Los Angeles Times*. September 5.

Demaster, D.P. 1998a. Letter to Micheal Spear, Regional Director, Region 1, U.S. Fish and Wildlife Service. April 23. Chair, Southern Sea Otter Recovery Team. Seattle, Washington.

Demaster, D.P. 1998b. Letter to Micheal Spear, Regional Director, Region 1, U.S. Fish and Wildlife Service. June 1. Chair, Southern Sea Otter Recovery Team. Seattle, Washington.

Estes, J. 1999. Comments on the draft biological opinion on the containment program for the southern sea otter. Dated November 19. Biologist. Biological Resources Division, U.S. Geological Survey. Santa Cruz, California.

Forney, K.A., S.R. Benson, G.A. Cameron. In press. Central California gillnet effort and bycatch of sensitive species, 1990-98. *In* E.F. Melvin and J.K. Parrish (eds.). Seabird Bycatch: Trends, Roadblocks, and Solutions. Proceedings of an International Symposium of the pacific Seabird Group, Semi-Ah-Moo, Washington, February 1999. University of Alaska Sea Grant, Fairbanks, Alaska.

Garshelis, D.L., A.M. Johnson, and J.A. Garshelis. 1984. Social organization of sea otters in Prince William Sound, Alaska. Canadian Journal of Zoology 62:2648-2658.

Harris, M. 2000. Electronic mail to Carl Benz, U.S. Fish and Wildlife Service. Southern sea otter biologist, California Department of Fish and Game. Moro Bay, California.

Hatfield, B. 2000. Electronic mail to Carl Benz, U.S. Fish and Wildlife Service. Biologist. Biological Resources Division, U.S. Geological Survey. San Simeon, California.

Hatfield, B., and J. Estes. 2000. Preliminary results of an evaluation of the potential threat to sea otters posed by the nearshore finfish trap fishery. U.S. Geological Survey, Santa Cruz, California.

Jameson, R.J. 1989. Movements, home range, and territories of male sea otters off central California. Marine Mammal Science 5(2):159-172.

Jameson, R.J. 1998. Sexual segregation in sea otters and its role in range expansion. In: Otter Raft (newsletter of the Friends of the Sea Otter):60:6-8.

Jarman, W.M., C.E. Bacon, J.E. Estes, M. Simon, and R.J. Norstrom. 1996. Organochlorine Contaminants in Sea Otters; The Sea Otter as a Bio-Indicator. *In*: J.F. Watson and T.L. Root, eds. 1996. Endangered Species Update 13(12):31-35, The School of Natural Resources and Environment, University of Michigan, Ann Arbor.

Kannan, K., K.S. Guruge, N.J. Thomas, S. Tanabe, and J.P. Giesy. 1998. Butyltin Residues in Southern Sea Otters (*Enhydra lutris nereis*) Found Dead along California Coastal Waters. Environ. Sci. Technol. 32:1169-1175.

Lieberg-Clark, P., C.E. Bacon, S.A. Burns, W.M. Jarman, and B.J. LaBoeuf. 1995. DDT in California sea lions: a follow-up study after twenty years. Marine Pollution Bulletin 30:744-745.

Nakata, H., K. Kannan,, L. Jing, N. Thomas, S. Tanabe, and J.P. Giesy. 1998. Accumulation pattern of organochlorine pesticides and polychlorinated biphenyls in southern sea otters (*Enhydra lutris nereis*) found stranded along coastal California, USA. Environmental Pollution 103:45-53.

National Marine Fisheries Service. 1999. Monterey Bay set gillnet observer program. Quarterly status report. July 1, 1999 - September 30, 1999. Sustainable Fisheries Division, Southwest Division. LaJolla, California.

Pierson, M.O. 2000. Personal communication. Wildlife biologist. Minerals Management Service. Camarillo, California.

Ralls, K., D.B. Siniff, A. Doroff, and A. Mercure. 1992. Movements of sea otters relocated along the California coast. Marine Mammal Science 8(2):178-184.

Riedman, M.L., and J.A. Estes. 1990. The Sea Otter (*Enhydra lutris*): Behavior, Ecology, and Natural History. Biological Report 90(14). U.S. Fish and Wildlife Service. Washington, D.C.

Sanders, G. 2000. Personal communication. Biologist, Ventura Fish and Wildlife Office, U.S. Fish and Wildlife Service, Ventura, California.

Stephenson, M. 1998. Personal communication. California Department of Fish and Game.

Thomas, N.J., and R.A. Cole. 1996. The Risk of Disease and Threats to the Wild Population. *In*: J.F. Watson and T.L. Root, eds. 1996. Endangered Species Update 13(12):23-27, The School of Natural Resources and Environment, University of Michigan, Ann Arbor.

U.S. Fish and Wildlife Service. 1982. Southern Sea Otter Recovery Plan. Portland, Oregon.

U.S. Fish and Wildlife Service. 1987a. Final Environmental Impact Statement: Translocation of

shandWildlifeService,OfficeofSeaOtterCoordination

, Sacramento, California and Institute of Marine Science

s, University of California, Santa Cruz.

U.S. Fish and Wildlife Service. 1987b. Intra-Service Endangered Species Biological Opinion, Translocation of Southern (California) Sea Otters to San Nicolas Island, Ventura County, California 1-RO-86-FW-22. Portland, Oregon.

U.S. Fish and Wildlife Service. 1988. Annual Report. Southern Sea Otter Translocation to San Nicolas Island. California, August 1987 - July 1988. Ventura Endangered Species Recovery Office, Ventura, California.

U.S. Fish and Wildlife Service. 1989. Annual Report. Southern Sea Otter Translocation to San Nicolas Island. August 1987 - July 1988. Ventura Endangered Species Recovery Office, Ventura, California.

U.S. Fish and Wildlife Service. 1990. Annual Report. Southern Sea Otter Translocation to San Nicolas Island. August 1989 - July 1990. Ventura Field Office, Ventura, California.

U.S. Fish and Wildlife Service. 1991. Annual Report. Southern Sea Otter Translocation to San Nicolas Island. August 1990 - July 1991. Ventura Field Office, Ventura, California.

U.S. Fish and Wildlife Service. 1992a. Annual Report. Southern Sea Otter Translocation to San Nicolas Island. August 1991 - July 1992. Ventura Field Office, Ventura, California.

U.S. Fish and Wildlife Service. 1992b. Draft White Paper - Zonal Management and Southern Sea Otter Recovery. Memorandum from Southern Sea Otter Recovery Coordinator, Ventura Office, Ventura, California to Assistant Regional Director, Fish and Wildlife Enhancement, Portland, Oregon.

U.S. Fish and Wildlife Service. 1993a. Annual Report. Southern Sea Otter Translocation to San Nicolas Island. August 1992 - July 1993. Ventura Field Office, Ventura, California.

U.S. Fish and Wildlife Service. 1993b. Evaluation of the southern sea otter translocation program, August 1987 to July 1993. Draft document produced by the Ventura Field Office, Ventura, California.

U.S. Fish and Wildlife Service. 1994. Summary of sea otter translocation meeting with the California Department of Fish and Game on February 14, 1994. Memorandum from Field Supervisor, Ecological Services - Ventura Field Office, Ventura, California to Assistant Regional Director - Ecological Services, Portland, Oregon.

U.S. Fish and Wildlife Service. 1995a. Draft Southern Sea Otter Recovery Plan. Ventura, California.

U.S. Fish and Wildlife Service. 1995b. Seventh and Eighth Annual Report, Southern Sea Otter Translocation to San Nicolas Island, California, August 1993 - July 1995. Ventura Endangered Species Recovery Office, Ventura, California.

U.S. Fish and Wildlife Service. 2000. Draft Revised Recovery Plan for the Southern Sea Otter (*Enhydra lutris nereis*). Portland, Oregon.

U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1998. Draft Biological Opinion to the U.S. Environmental Protection Agency for its Proposed Rule for the Promulgation of Water Quality Standards: Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California. Portland, Oregon and Long Beach, California.

U.S. Geological Survey, Biological Resources Division. 1998. Population Status of the California Sea Otter. Prepared for the U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office, California. University of California, Santa Cruz.

U.S. Minerals Management Service. 2000. Letter to Ventura Fish and Wildlife Office, U.S. Fish and Wildlife Service regarding the draft recovery plan for the southern sea otter. Dated April 6. Camarillo, California.

Wilson, D.E., M.A. Bogan, R.L. Brownell, Jr., A.M. Burdin, and M.K. Maminov. 1991. Geographic variation in sea otters, *Enhydra lutris*. Journal of Mammalogy 72(1):22-36.

Wren, C.D. 1986. A review of metal accumulation and toxicity in wild mammals. I. Mercury. Environ. Res. 40:1737-1744.

Table 1. Known Mortalities of Southern Sea Otters
associated with the Translocation and Containment Programs

Form of Mortality	First Annual Report	Second Annual Report	Third Annual Report	Fourth Annual Report	Fifth Annual Report	Sixth Annual Report
Died at San Nicolas Island prior to release	3	-	-	-	-	-
Found dead in parent range	-	-	-	-	1	3
Found dead in management zone	2	-	3	1	-	-
Died at Monterey Bay Aquarium	4	1	1	1	-	-
Died after capture for translocation	-	1	-	-	-	-
Died after containment activities	1	-	-	1	-	2

First Annual Report - Both of the dead southern sea otters from the management zone were found in Ventura County (Service 1988). The individual that died after containment was a pup that entered the management zone from the parent range (Sanders pers. comm. 2000).

Second Annual Report - The southern sea otter that died after capture for translocation was captured to be translocated to San Nicolas Island, released at the point of capture, and found dead shortly after (Service 1989).

Third Annual Report - Four individuals were found dead in the management zone, but only three could be confirmed as animals that had been translocated to San Nicolas Island (Service 1990).

Fourth Annual Report - The southern sea otter found dead in the management zone was located at San Miguel Island; this individual had previously been translocated to San Nicolas Island.
The individual that died after being captured on the mainland as part of the containment program had entered the management zone from the parent range (Service 1991).

Fifth Annual Report - This individual had been translocated to San Nicolas Island (Service 1992a)

Sixth Annual Report - The two southern sea otters that died after being captured at San Miguel Island as part of the containment program had entered the management zone from the parent range. The three found dead in the parent range had been translocated to San Nicolas Island (Service 1993a).

Table 2. Southern Sea Otter Population Counts 1982 - 1998*

Year	Spring	Fall
1982	1,346	1,351
1983	1,277	1,223
1984	1,303	1,203
1985	1,361	1,215
1986	1,586	1,204
1987	1,661	1,307
1988	1,725	No Survey
1989	1,856	1,607
1990	1,680	1,636
1991	1,941	1,661
1992	2,101	1,715
1993	2,239	1,805
1994	2,359	1,845
1995	2,377	2,190
1996	2,278	2,019
1997	2,229	2,205
1998	2,114	1,937
1999	2,090	1,970
2000	2,317	

* Note: These totals reflect only the numbers of individuals encountered along the mainland.